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AMERICAN MACHINIST

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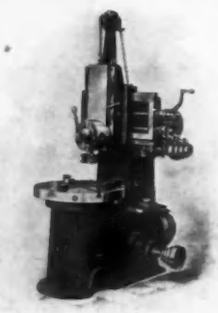
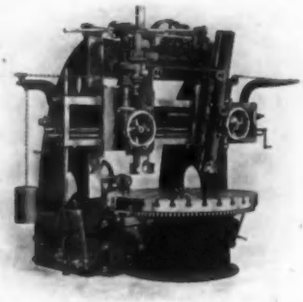
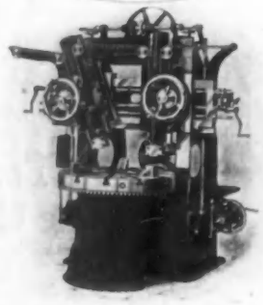


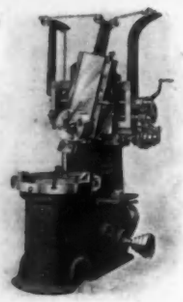
30-inch, Turret Head.



62-inch, Regular and Special Heads.



37-inch, Two Regular Heads.



30-inch, Swivel Turret.

The Bullard
Machine Tool
Company,
Bridgeport, Conn., U.S.A.

make a specialty of high grade boring and turning mills for all purposes. Machinery for duplicating parts that must be turned, bored, faced or threaded.

Correspondence desired.

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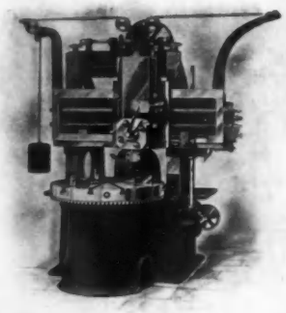
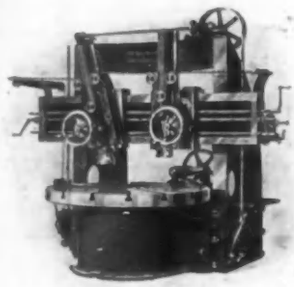
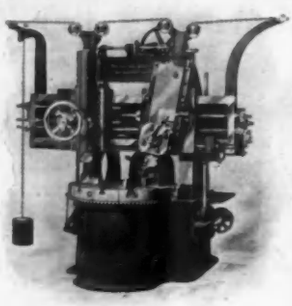
51-inch, Two Regular Heads.



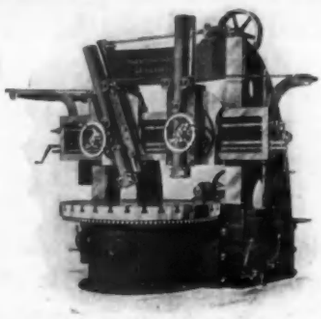
42-inch, One Turret.



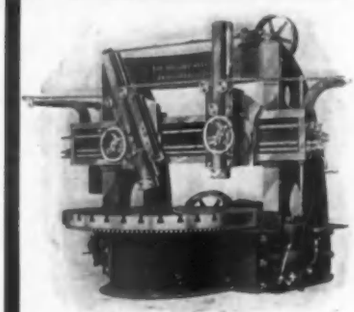
60-inch, Two Regular Heads.



42-inch, Turret and Special.



62-inch, Two Regular Heads.



76-inch, Two Regular Heads.

We Planned First

on making a good lathe—the best lathe—then—after we had crowded every good point that 53 years of machine tool building has brought us, into that lathe—and not till then, did we consider the cost.

We figured on the cost of building that lathe in the best possible manner—on putting into it the very best of materials and workmanship that money could buy—and, after adding a fair profit, produced a lathe that is easily the best at a price that is very low indeed for such a product.

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years to be in one line of business. To remain in one line of business for that length of time and be successful, a man must know his business pretty well. Baxter D. Whitney has been in the business of building Wood-working Machinery for sixty years, and has been successful. He has been successful because he knew there was a demand for wood-working machinery of the better kind and because he built that kind.

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▼▼▼▼▼

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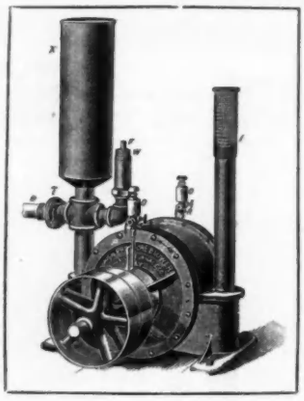

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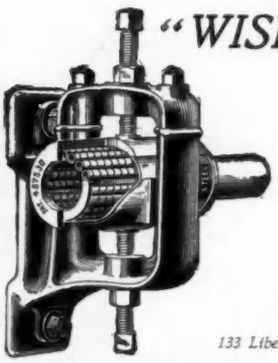

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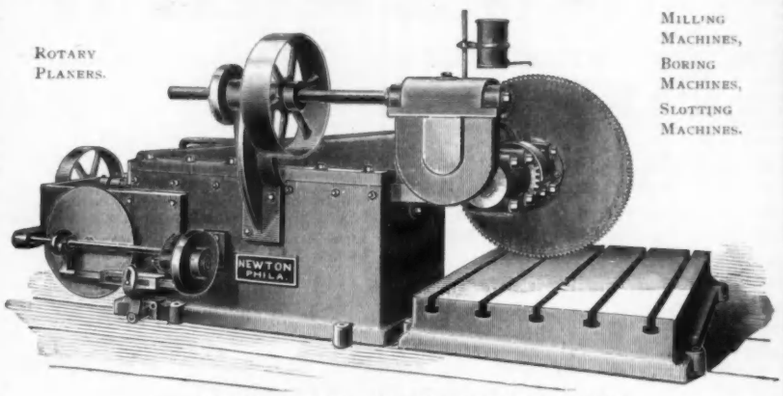

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EVANS FRICTION CONES.

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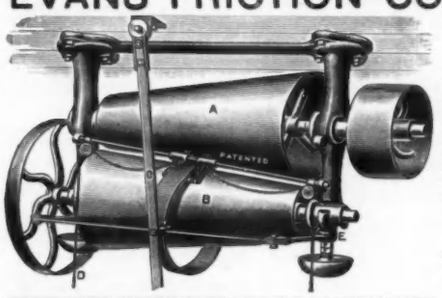

The following is a partial list of Manufacturers who have Evans Friction Cone Pulleys in operation:

National Biscuit Co., Richmond, Ind.,	150 Sets, 6 H. P.
John & James Dobson, Philadelphia, Pa.	34 Sets, 2 H. P.
Samuel Cupples Co., St. Louis,	25 Sets, 3 H. P.
Atlas Cement Co., 143 Liberty St., New York,	8 Sets, 20 H. P.
Washburn & Moen, Worcester,	A large number, all sizes.
Nonotuck Mills, Holyoke, Mass.,	16 Sets, 6 H. P.
Stinson Brothers, Carpet Mfgrs., Philadelphia,	40 Sets, 2 H. P.
Massasoit Paper Company, Holyoke, Mass.,	2 Sets, 40 H. P.
F. W. Bird, East Walpole, Mass.,	2 Sets, 40 H. P.
Arnold Print Works, North Adams, Mass.,	10 Sets, 6 H. P.
Merrimack Mills, Lowell, Mass.,	28 Sets, 10 H. P.
Dennison Mfg. Co., Mass.,	Large number.

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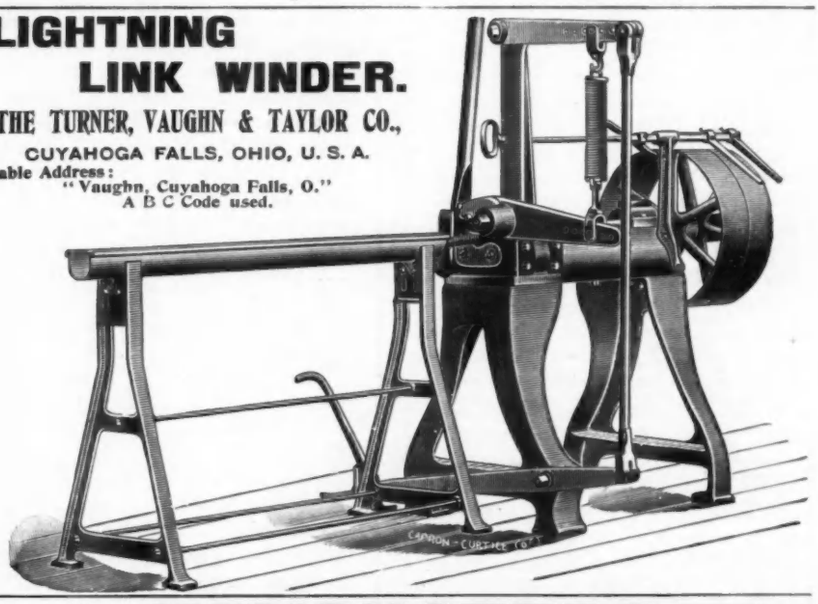

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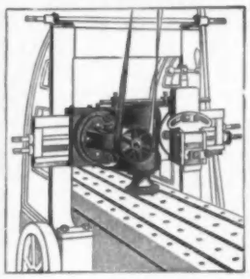

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Notice.

On and after September 1, 1899, Mr. Angus Ballard, late with the Colliery Engineer Company, of Scranton, Pa., will represent the business end of the "American Machinist" in New England.

Mr. John McGhie, lately our representative in the West, will take charge of the middle territory, which includes the States of New York, Pennsylvania, New Jersey, Delaware, Maryland and the two Virginias.

Mr. William R. Wallis, lately with the Journal of Commerce Company, St. Louis, will represent us in the Western territory.

THE AMERICAN MACHINIST PRESS.

The "Average Man" as an Employee

We print in another part of this issue an article entitled "A Message to Garcia." This was first published in the "Philistine Magazine," and has attracted a great deal of attention. It reaches us as one of the New York Central's "Four Track Series," and on the cover of the pamphlet a prominent New York clergyman is quoted as saying, "It is gospel truth every word of it. Its publication will do great good," and the president of an important Southern railway as saying, "Every young man in America should memorize the 'Message to Garcia'—it contains the key to success." And yet, though we know it is somewhat hazardous to differ from the majority in a matter of this kind, we cannot help thinking that this piece of writing is greatly overrated, and besides that the chief lesson it conveys is for managers of business and industrial establishments rather than for employees in them.

The office depicted, in which no clerk simply goes ahead and does what he is asked to do, is not an office filled with imbeciles, but is one that needs a new manager.

If anything more than this picture of a mismanaged office were needed to prove that the writer of the "Message to Garcia" is barking up the wrong tree, it is to be found in the passage, "Now, if you are wise you will not bother to explain," etc., "but will smile sweetly and say 'Never mind,' and go look it up yourself." As a matter of fact, if you are wise, you will do nothing of the kind. You will, in the first place, not ask an assistant to do a thing not clearly within the line of his duty and within his capabilities, and then having given him the order, you will expect him to do the work, and will insist upon its being done properly. Then when you find you have in your employ a man who cannot be depended upon to do the work you want done, and cannot be trained to do it, who, instead of doing his best, asks foolish questions and persists in doing so after the error of his way has been pointed out to him, you will allow him to seek a position in an office whose manager is foolish enough to tolerate things of that sort and you will get a man of better timbre. You may have to pay the new man a little higher wages. He will be worth it.

Again, an employer must not expect to employ mind-readers at $5 to $10 a week; and some employers seem to expect to do just that. That is to say, they will not allow anyone to go ahead and do a piece of work in his own way, but expect it to be done precisely as they would do it, and that without any instructions or even a hint being given to indicate what way that would be.

The man who built up the railroad system which now publishes and so warmly endorses "A Message to Garcia" once had a man employed as general freight agent. He was really an able man and drew a liberal salary. But one day a question of more than ordinary import arose and this man went to Commodore Vanderbilt and asked what he should do about it. Said the Commodore, "I do not propose to decide. You are employed as general freight agent and paid a liberal salary because you are believed to be competent to decide such questions wisely and well. You must decide them and carry the responsibility." Does anyone suppose that Commodore Vanderbilt would have "smiled, etc.," or that he would have endorsed such twaddle as "A Message to Garcia"? No, Vanderbilt knew that he must have a man in every position competent to bear the responsibilities of his position, and he knew how to place responsibility fully upon them.

An equally famous man who did not understand this was Geo. H. Corliss. He fully believed that nothing was done just right unless he did it himself. He had from time to time able men with him, but the only way in which they ever were able to prove their ability was by leaving him and making a success of competing establishments. Corliss never allowed one of them to do anything of importance on his own responsibility. And when Corliss was finally obliged to recognize the fact that he was beaten by his competitors, he shut himself up still more closely, refused to call in the aid of those who could have helped him, and in his old age designed a system of manufacture which was absurdly inadequate and a foredoomed failure. Corliss would have endorsed "A Message to Garcia." There is no doubt that he thought that whatever points of failure or of lack of full success there were about his establishment were due to "the imbecility of the average man," and with his last expiring breath the death-knell of the establishment he had built up was sounded.

Over twenty years ago "Chordal" drew, in these columns, a pen-picture of the man who believes that the average man (that is, the other man) is an imbecile and cannot be trusted to do anything by himself. "Chordal" goes into this man's machine shop and thus describes the scene:

"Here we find Wycoff, coat off and honestly greasy. Yes, he does keep a foreman, or tries to rather; kings without thrones. 'Ah! Mr. Chordal, how do you do? Happy to meet you Mr. Miller and you Mr. Bailey. Excuse my gloves. Belong to the laboring classes, you see. Look busy, eh? Should think I was; got enough work to—excuse me, gentlemen,

got to shrink this crank on.' We now notice that just in front of us, on trestles, lies a 6-inch shaft with an end projecting. And now upon the scene, through the blacksmith shop door, come four men whom I know to be the best paid machinists in the shop, bearing a 30-inch crank plate, glowing hot. They quickly place it in position to start on the shaft, and proceed to urge it. From the time Wycoff left us he has not ceased to speak or excitedly yell over this job. We know a single yell will spoil a shrinking fit, but Wycoff probably don't know it. Now an excited order to one man to go for that block; to this man to raise up; and to that one to let down, 'damn it'; now a snub to the man who is really responsible for the job; now he frantically grabs a sledge and strikes a lick or two; now at something else. Every word spoken seems to be immature, every action a false one. We walk on. You remark that Wycoff doesn't seem to be a cool man, and that if you had any money invested in that crank you would prefer to entrust the job to the 'jour' whom Wycoff just snubbed, and who seems to have lost all interest in the proceeding, simply looking on with servile disgust."

Wycoff would undoubtedly have had a copy of "A Message to Garcia" framed and hung up in his office to comfort himself with when cranks stuck and things went wrong generally.

The fact is that although there is here and there a man who might be benefited by considering the lessons taught in the article referred to, it is a slander on the employed. The "average man" is the real representative of the genus *homo*. He is not an imbecile, and the man who regards him as such is an egotist and is afflicted with a swelled head. The average employed man knows that his bread and butter depend upon his efficiency and faithfulness, and he is efficient and faithful. He would much prefer to have the responsibility for his own work laid unreservedly upon him, be allowed to do it in his own way, and be held responsible for results. He often finds, however, that a good share of his energy and skill must be devoted to "managing" a cranky employer or foreman, so as to be allowed to do something.

In some industrial establishments one can hear constant complaints about the men—their unfaithfulness, lack of interest in their work, lack of forethought, etc., etc. In other establishments you hear an entirely different story about good men, faithful, enthusiastic, skilled, and so on. Does anyone suppose that the Almighty has made a special set of men above "the average" for the last-named establishment. "On your life," he did not. They are just the same "average men"; but the management is different. There is as much difference between the "average man" doing his best and doing his worst as between a genius and a dolt. And whether an average man will do his best or his worst in any given station of employment depends very, very much upon what he is encouraged or allowed to do.

How much of an endorsement would "A Message to Garcia" get from the proprietors of the National Cash Register shops, for instance? There they freely boast of the "splendid enthusiasm," faithfulness and skill of their employees—and they mean it, too. Are we to suppose that wingless angels have been created especially for that shop? No, they are the "average" people. But the management! That is different, though its details are largely in the hands of these same average men; and every employee knows not only that he may do his best mentally and physically, but also that he will get full and openly avowed credit for whatever he may do that is creditable.

So far as "A Message to Garcia" teaches the importance of being willing to assume responsibility and go ahead with assigned tasks is concerned, it is all right enough. But that its author depicts the average employee we do not believe. When an employer becomes thoroughly convinced of the "imbecility of the average man," when he thinks he can get no faithful or efficient service from his employees, he need not waste his time sighing for archangels to do his work, but should look to his own management. That is where the fault lies.

Practical Education.

Few of us would think of consulting an Indian in an educational matter probably, and yet it seems to be possible for an Indian to hold the most advanced views on educational affairs, and the story printed below seems to show that some Indians at least did hold advanced views on the subject many years ago. That is to say, they had thoroughly grasped the idea that that education is best which best fits the probable needs of the student in after life.

In the January "Century" P. L. Ford quotes Benjamin Franklin as saying that "Most of the learning in use is of no great use," and to illustrate this idea and to show the difference between book knowledge and real knowledge he used to tell the following story of what took place in connection with one of the early Indian treaties: "After the principal business was settled, the commissioners from Virginia acquainted the Indians by a speech that there was at Williamsburg a college with a fund for educating Indian youth; and that, if the Six Nations would send down half a dozen of their young lads to that college, the government would take care that they should be well provided for, and instructed in all the learning of the white people. . . . 'We are convinced (the Indians replied) that you mean to do us good by your proposal, and we thank you heartily. But you, who are wise, must know that different nations have different conceptions of things; and you will therefore not take it amiss if our ideas of this kind of education happen not to be the same with yours. We have had some experience of it; several of our young people were formerly brought up at the colleges of the northern provinces; they were instructed in all your sciences; but when they came back to us they were bad runners, ignorant of every means of living in the woods, unable to bear cold or hunger, knew neither how to build a cabin, take a deer, nor kill an enemy, spoke our language imperfectly, were therefore neither fit for hunters, warriors nor counsellors; they were totally good for nothing. We are, however, not the less obliged by your kind offer, though we decline accepting it; and, to show our grateful sense of it, if the gentlemen of Virginia will send us a dozen of their sons, we will take great care of their education, instruct them in all we know, and make *men* of them.' "

Daring Invention.

A recent alleged invention seems to have nearly reached the limit attainable by the unbridled inventive faculty. The "inventor" is one of the best and most experienced brass molders in the United States, who has, for the time, laid down the rammer and the trowel and has gone into marine engineering. His invention proposes to make ships pass more easily through the water than they have been in the habit of doing, and for this purpose he covers as much as possible of the submerged surface with cylindrical rollers, whose axes are at right angles to the axis of the ship. Visitors who inspect the model are invited to pass their hands over the rollers, then over the normal surface of the vessel, and to note the difference in the friction, and it is argued that water will be equally appreciative of the device. The invention has been brought to the attention of the Navy Department.

A somewhat unique form of speed test between a torpedo boat destroyer and torpedo boat is to be held at Halifax, N. S., soon. The destroyer is rated at 30 knots, while the torpedo boat has a speed of 22 knots. The proposed test will demonstrate how long it will take a torpedo boat destroyer, such as the "Quail," which is the name of the one referred to above, to overtake a torpedo boat of 22 knots, and in order to ascertain this it is proposed to give the latter a start of 30 minutes, thus allowing her to get 10 miles out to sea. Then the destroyer will start in pursuit, and it is expected that in a run of 100 miles she will overtake the torpedo boat on her way back, pass her and reach dock again 50 minutes ahead.

The article by Prof. Ferrero, in another part of this issue, is a very neat geometrical proposition, and although the demonstration is somewhat formidable in appearance, the examples given will show the application to be simple.

Commercial Review.

NEW YORK, SATURDAY EVENING,
August 12, 1899.

DYNAMOS AND MOTORS.

The market has shown but slight susceptibility to summer dullness this year. Contrary to precedent, business has kept on month after month with very nearly, if not quite, the same amount of activity at one time as another. Companies which confine themselves to making direct current machines are still supplying apparatus freely to industrial concerns. This business comes to a great extent in driblets, a motor here and two or three there, but it sums up well at the end of the month. Manufacturers in various lines are so busy that they have not time to install shafting when they want to add a new machine, so they send out and get an electric motor, which saves much trouble.

Alternating current machinery, judging from the experience of the General Electric Company, is in as active demand as ever. The North Jersey Street Railway Company has just ordered about $112,000 of General Electric material, including fifty motor equipments with electric brakes. Foreign trade of the General Electric Company is running very heavy, though not characterized by any unusually large single contracts.

The specifications for the electrical machines for the Manhattan Elevated Railway's power plant are out. They call for fifteen 5,000-kilowatt, 3-phase generators, 75,000 kilowatts in all, and an equal capacity of rotary transformers in 1,500-kilowatt units. Two months may elapse before the contracts are let.

Electrical machinery factories, so far as figures have been stated to us, are from six weeks to four or five months behind with orders.

Prices are still tending upward. A 5 per cent. increase was made by the Bullock Electric and Manufacturing Company at the first of this month. The Crocker-Wheeler Company last week made an advance on large machinery averaging about 10 per cent. Their increase of prices since the first of the year, although about 25 per cent. net, hardly compensates, or fails to compensate, for the rise in materials.

In factory installations power and lighting work go hand in hand. Where a generator is put in to furnish current for motors it will be ordered in sufficient size to light some lamps as well, and where a dynamo is to be installed for lighting purposes a few motors are apt to be purchased along with it. In a very few weeks from now there should be an increased inquiry for lighting outfits pure and simple for installation in non-industrial buildings.

The New York Edison Electric Illuminating Company has for some time had plans drawn up for a large new power station, in which it was proposed to install 90,000 horse-power of boilers. Specifications for fifty-six 600 horse-power boilers, amounting to 33,600 horse-power, are now in the hands of boiler manufacturers to figure upon in a tentative way.

A press dispatch announces that at an extraordinary meeting of the British Westinghouse Company it has been decided to take over the Manchester Westinghouse Works, which are about to be erected, and which have hitherto had a separate organization. The capital of the British Westinghouse company has been increased by $1,250,000. An American company has agreed to supply all the ironwork for the new factory in four months.

Bids for the power plant and cranes for the new steam engineering shop of the New York Navy Yard (for particulars see "American Machinist," July 13) were opened August 8. The bidders on the power plant included the United Company, New York; the Westinghouse Electric and Manufacturing Company, and the Bullock Electric Manufacturing Company. The range of bids in round numbers was from $150,000 to $190,000. On the cranes there were six bidders. On the 40-ton crane the lowest bidders were Pawling & Harnischfeger, $10,000; on the four 10-ton cranes the same firm, at $4,375 each, and on the 25-ton crane the Morgan Engineering Company, at $6,930.

A syndicate entitled the Electrical Corporation, Limited, has been organized in London, with the intention, it is said, of acquiring the concessions for electric traction and lighting in Valparaiso, Chili. It is expected that a steam plant will be purchased directly, and that eventually the current will be generated by power from the Aconcagua River.

The C & C Electric Company has lately been very successful with its English trade, and is sending to that country some large consignments. F. Nell, of Liverpool, has lately purchased a 125 kilowatt direct-connected generator of that make. The C & C Company is building four or five 30 kilowatt generators for vessels of the United States navy.

MISCELLANEOUS.

A well-known company in Rhode Island which manufactures pressing, stamping and rolling machinery, etc., recently turned down a $15,000 order for a rod mill because it had so much work on hand that it could not undertake to promise execution of the contract within a satisfactory time.

The Deutsche Niles Werkzeugmaschinen-fabrik, Berlin, Germany, has ordered of the Buffalo Forge Company an outfit for the heating and ventilation of its new works. The apparatus for the machine shop consists of two full housing fans, each standing 15 feet high, with which will be used 23,000 feet of heating pipe arranged according to the Buffalo fan system. In the foundry will be two fans about 12 feet tall, with 10,000 feet of pipe. Also, an outfit of the Buffalo Forge Company's machinery, including fourteen forges, a blower and exhauster, has been ordered for the forge shop of this German Niles Company.

The American Sugar Company is erecting some extensive works on its new 93,000-acre plantation on the island of Molokai, Hawaiian group, and it is said that $400,000 has been spent for the machinery alone. A Farrell crushing plant, Harris-Corliss and Buffalo Forge engines, Blake pumps, and over $4,000 worth of machine tools are stated to be included in the contracts.

Morse Twist Drill and Machine Company are adding 24,000 square feet of floor space to their shops, and have been ordering machine tools quite freely of late, though only for immediate needs and not for the new building.

The Hyatt Roller Bearing Company has lately closed contracts to install its shafting-hangers and boxes in new plants or additions of the Elmira Knitting Company, Elmira, N .Y.; Norwalk Iron Works Company, South Norwalk, Conn.; Ferracute Machine Company, Bridgeton, N. J., and Columbia & Electric Vehicle Company, Hartford, Conn.

It is reported that a 27-mile line of railroad, extending from Rodas to Carthagena, Cuba, has been purchased by parties who will rebuild it and will erect at Rodas a new machine shop. Mr. Francisco, of Rasco, Santa Clara, Cuba, has been appointed manager, and will purchase new equipment, rolling stock and supplies.

Anglo-American pig iron trade seems to be a matter of give and take. Iron used to be shipped across the ocean Westward, two or three years ago it turned Eastward, and now some of it is inclined to come this way again, simply because people in either hemisphere are picking up what they can find, wherever it may be. A recent drop of over $2 per ton in warrants at Glasgow elicited animated cable inquiries from America, which would probably have resulted in orders had the price gone on downward a little further, instead of reacting upward.

The Buffalo Forge Company last summer installed for the Laflin & Rand Powder Company four drying plants for gun cotton. These drying houses were the device of Mr. T. C. Maxfield, manager of the New York office of the Buffalo Forge Company. They are required to eliminate moisture from the gun cotton at least as low as one-half of one per cent, otherwise it would not be accepted by the Government. The Laflin & Rand Company is said to have accomplished with these dryhouses in 6 hours what formerly required 24 hours. As a result of their successful use in this case the United States Government has ordered one through Mr. Maxfield, and the Atlantic

Dynamite Works have ordered three, two of which are for the American Forcite Powder Manufacturing Company, Hopatcong, N. J., and one for the Hercules Powder Company, Ashburn, Mo.

The Niles-Bement-Pond Company was incorporated in Trenton, N. J., August 11, with a capital of $8,000,000. This is the company which is expected to absorb the Niles Tool Works, Pond Machine Tool, Bement-Miles and Philadelphia Engineering Works properties.

The experience of a manager of a machinery building concern the other day is of interest as showing the present condition of the market for some of the things needed in machine construction. This man had a contract with a large steel casting establishment to furnish 150,000 pounds of steel castings per month. The foundry, however, could deliver only half as much as it had agreed to, and finally, being pushed for the work, he started out in search of a foundry which would do better. He was prepared to place a contract for 300,000 pounds of steel castings to be delivered 75,000 pounds per month, and naturally thought that a man prepared to place such a contract would receive some consideration, an opinion based, of course, on previous experience in similar lines. The first place he stopped at was a large establishment in which, after considering the matter rather calmly and indifferently, they proposed to make his castings if he desired them to do so, but on making the price their figures were found to be more than four times the price he was already paying. He remonstrated with them about this and called their attention to the fact that the castings were not small ones, but were large and of heavy section. They said they knew all about that and understood it thoroughly, but that that was their price and they would make no concessions. Finally, when our friend was informed that no deliveries could be made within five or six weeks after receipt of order, he left to go to another place. This was a smaller establishment which was just getting into shape for doing work. This concern had previously sent him a letter, asking for blue prints and specifications of steel castings that might be desired, and he thought that surely here he would find people anxious to take his contract. He found them not fully organized, and with only about a day's supply of pig metal on hand suitable for his work, and with no positive assurance as to where any further supplies of it were to come from. On going into the office he discovered evidence that duplicates of the letter he had himself received had probably been sent to about all the other steel casting users, this evidence being in the shape of an imposing pile of blue prints and specifications on the manager's desk, showing that everybody using steel castings had probably jumped at this apparent chance for getting some of them. There was no prospect of doing anything here. At the third place he visited he was greeted by a face which appeared at a pigeon hole, and in answer to his inquiry stated that they wanted no more business for the next eight months at any price or on any terms. Two other concerns panned out to about the same result, and the final conclusion of our friend was that the people who were already giving him 75,000 pounds of steel castings per month on a contract calling for 150,000 pounds were doing pretty well. By vigorous talk to them regarding what arrangements he might make with other foundries if he only chose to, he extorted a promise from them that they would do better.

CHICAGO MACHINERY MARKET.

The condition of the machinists' supply trade in the West can be summed up in a few words. It is uniformly unprecedented for this season of the year. There has been no let up in the demand. The weekly and monthly footings of sales contain no vestiges of the so-called midsummer dullness. It is remarkable how general is this state of enduring activity. Among all kinds of shop accessory makers the report is monotonously the same, that the volume of business has not materially slackened during the summer. This covers the whole ground. It is an almost ideal condition of business. Plaints are heard only from those whose vacation season has been spoiled by the unexpected and sinewed trade. Speaking in generalities, the volume of business is perhaps 100 per cent. greater than that of a year ago; some sellers say 50 per cent., but a few run the mark up to 140 per cent. gain. As compared with May and June, there is a slight falling off, but the decrease is usually figured at about 5 or 10 per cent.

This gratifying state of things presupposes a continuation of factory operations through the summer, whereas a suspension of activity has heretofore usually intervened during the hot months. Continued activity has been forced upon all kinds of manufactories by the increasing demand for goods. What the fall trade will develop into is an interesting question for the future, but that there will be no decrease of activity is foreshadowed by the circumstance that most, if not all, manufacturers have already booked enough business to keep them busy for several months. No ordinary vision can see anything but a continuation of at least the present brisk gait of trade to the close of the year. Business men here seem to be figuring it out in that way.

Machinists' tools are now easy in point of supply. There are no accumulations visible, but the scantness of several months ago has disappeared. And in all the accessories that make up the shop purchases manufacturers, from all indications, have gaged the demand and have facilities for producing the goods. Prices are generally steady, with some tendency towards a further advance. But for shafting, pulleys, hangers and fittings for new plants the trade is still woefully behind the current requirements. The vim that has been injected into the enlargement of manufacturing capacity has not expended its force, and is crowding every department of supply. No new machine shops of note are heard of, but additions are numerous. It is impossible to obtain prompt work at any of the machine shops in this vicinity, so deeply buried are they in orders.

The Armstrong Bros. Tool Company, of this city, has recently doubled the capacity of its plant. It is now making dies for fourteen new tool holders, and reports a strong demand for its lately produced drill and reamer holder.

The new plant of the Reeves Pulley Company, at Columbus, Ind., for the manufacture of their variable speed countershaft is running full time, notwithstanding the vastly greater facilities for production that have thus been created.

Quotations.

NEW YORK, Monday, August 14.

Iron — American pig, tidewater delivery:—

Pennsylvania irons:

No. 1 X foundry	$20 60	@	22 10
No. 2 X foundry	20 60	@	21 10
No. 2 plain		@	20 10

Alabama irons for delivery in 1900:

No. 1 foundry	20 25	@	20 75
No. 2 foundry	19 25	@	19 75
No. 3 foundry	18 50	@	19 00
No. 1 soft	20 25	@	20 75
No. 2 soft	19 25	@	19 75
Foundry forge	18 25	@	18 50

Bar Iron—Base sizes—Refined, mill price on dock, 2.18 @ 2.25c.; store price, 2.40 @ 2.50c.; common, from store, 2.30c.

Tool Steel — Base sizes — Standard quality, 6½ @ 8½c.; extra grades, 12 @ 14c.; special grades, 16c., and upward.

Machinery Steel—Base sizes—Ordinary brands, from store, in small lots, 2.60c.

Cold Rolled Steel Shafting—Base sizes—From store, in small lots, 3¾c.

Copper—Carload lots, Lake Superior ingot, 18½ @ 18¾c.; electrolytic, 17¾c.; casting copper, 17½c.

Pig Lead—Carload lots, 4.60 @ 4.62½c., spot; September, 4.55c., f. o. b., New York.

Pig Tin—In 5 and 10 ton lots, f. o. b., 31¼ @ 31½c.

Spelter—Prime Western in carload lots, 5.70 @ 5.80c., early delivery at New York.

Antimony—In cask lots and over, Cookson's, 11c; Hallett's, 9¾ @ 9⅞c.

Lard Oil—Prime city, presnt make, ice pressed, 44 @ 46c., for the leading brand in wholesale lots.

FIG. 1. EXTERIOR VIEW OF WORKS.

The Shops and Products of Brioschi Finzi & Co., Milan, Italy.

These works are nearly new, being now but three years old, but in that brief time they have attained the front rank of Italian industries. The buildings are of the most substantial and modern construction, as the exterior and interior views, Figs. 1 and 2, will attest. Before beginning their construction, the firm sent a representative to this country to study American practice in factory design and management, as well as in electrical construction, and both the shop and its products are thus largely based on American practice—the equipment being largely of American make and the interchangeable system of production being followed. There has been no blind copying in these matters, however, and the products of the shop embody many original features.

The chief products of the shop are electric generators and motors of both the direct and alternating current systems, the latter being of the three-phase type, and on both the rotary field and the induction plans. The motors are made both open and closed to exclude dust, the latter construction of a direct-current motor being shown in Fig. 3, with a speed-reducing countershaft incorporated with the machine—a construction which has found favor in this country. Electrically these machines are also strictly up to date, having fixed brushes and operating under wide variations of load without sparking. Slotted and ventilated armatures are used, the coils being wound upon formers and being interchangeable. This type of machine has been officially adopted as standard by the Italian navy.

Fig. 4 shows a six-pole rotary converter driven by three-phase alternating current and delivering a continuous current, and Fig. 5 shows the standard three-phase en-

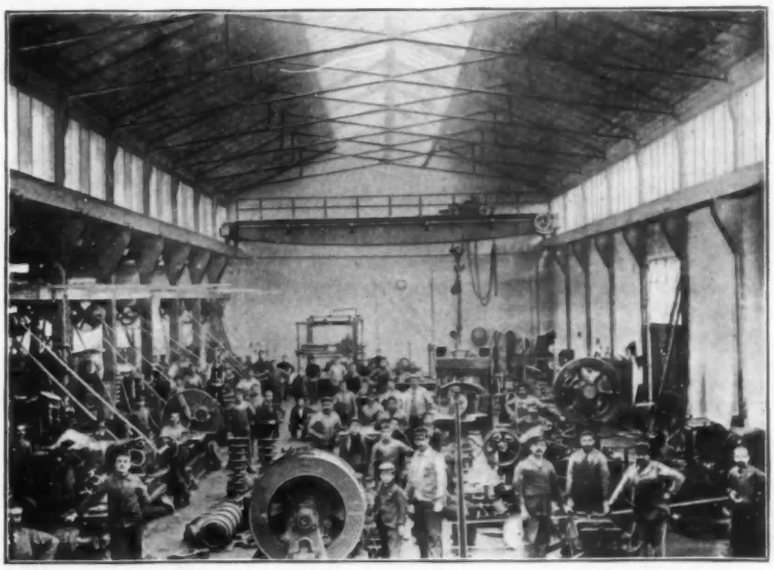


FIG. 2. INTERIOR VIEW OF WORKS.

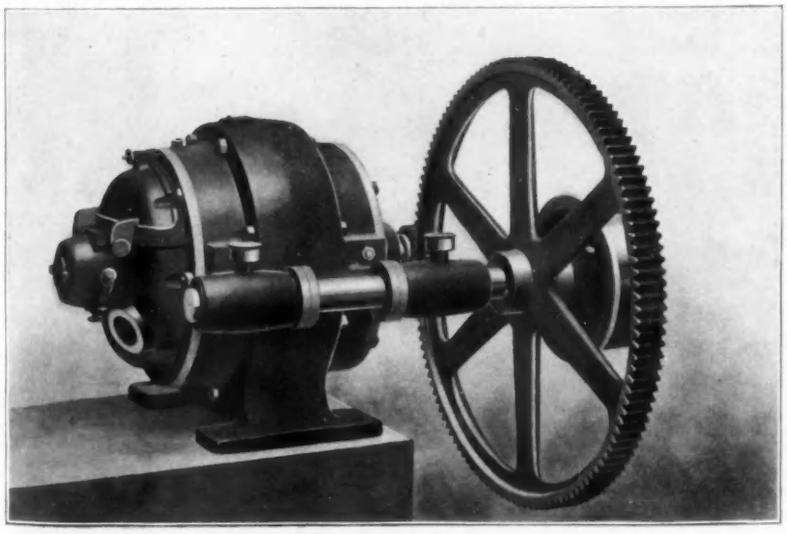


FIG. 3. ENCLOSED TYPE DIRECT-CURRENT MOTOR.

closed motors. Fig. 6 shows the same machine with an appliance used in connection with motors for driving printing presses. For this purpose double reduction speed-reducing gearing is used, the first reduction being by friction gearing. The suspension shown, in connection with the springs, serves to give a constant elastic contact between the friction wheels. A similar arrangement is used as a belt-tightener when short belts are used.

Fig. 7 shows a Lodge & Shipley lathe driven by a three-phase motor, the chief novelty of which lies in the method employed for keeping the belt tight. The motor and countershaft are hung in a frame which is pivoted to the upright, the pivot being so located that the weight of the motor tends to elevate the countershaft, and thus take up the slack of the belt.

Fig. 8 shows a novelty in an elastically suspended three-phase motor arranged for

driving a silk loom. For this work the jar resulting from the reciprocation of the shuttle and the pulsating effort required to drive the loom was found to entail serious difficulties which this construction met by the fact that the ring case may swing about the loom shaft; this swing being, however, resisted by the horizontal springs below the motor. The ring case will be seen to be suspended from the loom shaft by an eccentric sleeve, and by turning this sleeve the distance between loom and motor shafts may be adjusted to accommodate various combinations of gearing, and thus adjust the speed to the requirements. It will be observed that not only do the vertical springs absorb the pulsating torque, but they also carry the weight of the motor, and thus relieve the loom shaft of weight and wear. This construction has found a wide application in the numerous textile mills of Lombardy.

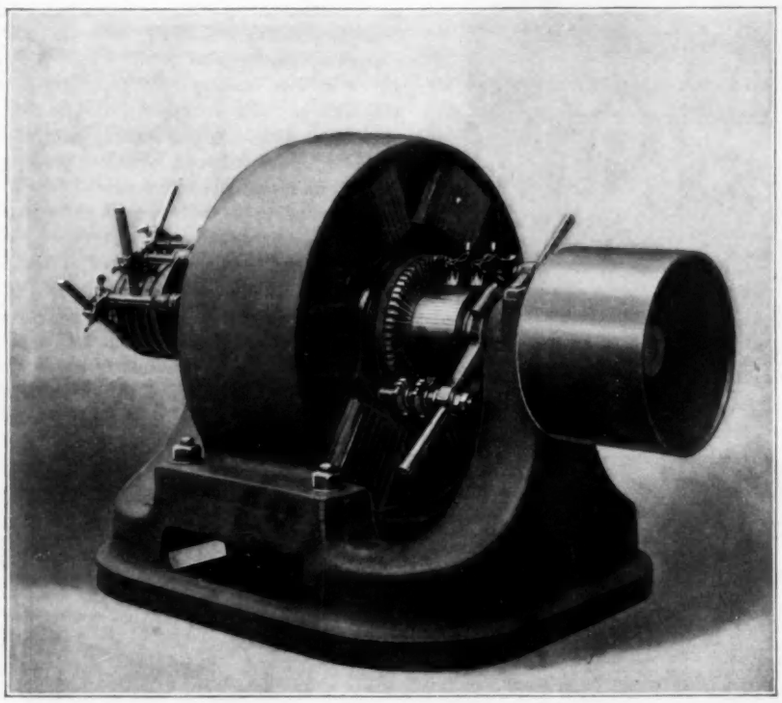


FIG. 4. ROTARY CONVERTER.

Fig. 9 is a three-phase inductor generator of 150 horse-power, and Fig. 10 is a 50 horse-power three-phase rotating field generator, with exciter connected to the same shaft. This last machine operates under a pressure of 3,000 volts. Fig. 11 is a three-phase rotating field generator with magnetic clutch for driving it, the horse-power being 300. All these machines have laminated magnetic circuits, interchangeable windings, and ventilated armatures.

The latest product of the works is a street car motor with an entirely new system of suspension, but of this we have no photograph.

Italy is extremely well supplied with water power, while at the same time she is without coal deposits. These conditions have operated to restrict manufacturing enterprises in the past, but electrical distribution of power obtained from the numerous streams is expected to operate very beneficially in correcting this state of affairs, while at the same time promoting the electrical industry.

Brioschi Finzi & Co. write us that they are making a trial of the premium plan. Their division of the savings gives 40 per cent. to the workman and 10 per cent. to a sick workmen's relief fund. They add, "We hope much from this experiment."

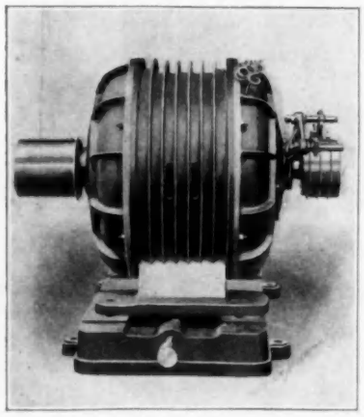


FIG. 5. STANDARD THREE-PHASE MOTOR.

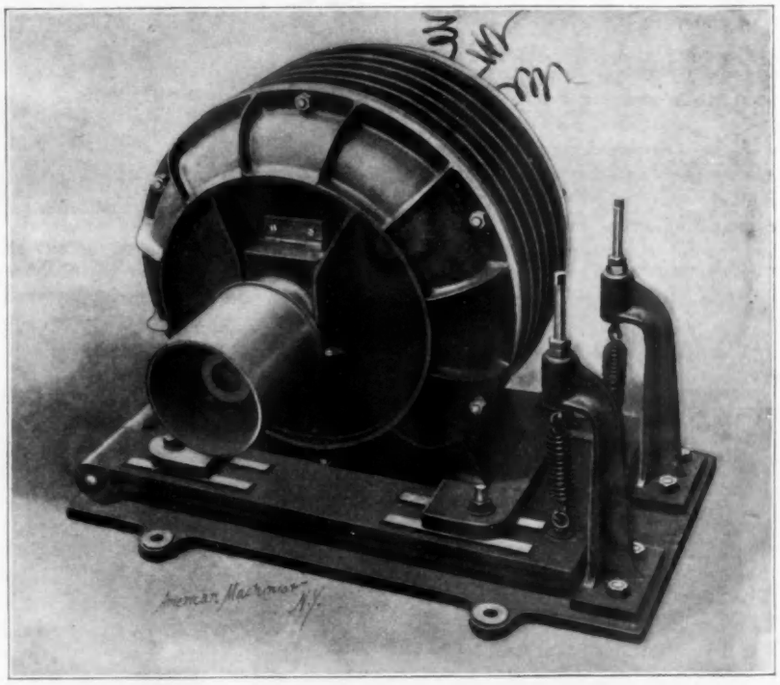


FIG. 6. MOTOR WITH ELASTIC SUSPENSION FOR USE WITH FRICTION GEARING.

was designed to overcome. The motor is placed in a ring-shaped casting, in which it may bodily turn, except for the resistance of the vertical springs. These are connected to lugs attached to the motor, and projecting through slotted openings in the ring case. The pulsating torque of the motor is thus absorbed by the springs. At the same time a fixed distance between the loom and motor shafts is secured by the ring being suspended from the loom shaft in the manner shown. The pulsating torque is of course accompanied by a corresponding pulsating pressure on and reaction by the driving gears, and this is

A Message to Garcia.

In all this Cuban business there is one man stands out on the horizon of my memory like Mars at perihelion. When war broke out between Spain and the United States, it was very necessary to communicate quickly with the leader of the insurgents. Garcia was somewhere in the mountain fastnesses of Cuba—no one knew where. No mail nor telegraph message could reach him. The President must secure his co-operation, and quickly. What to do!

Someone said to the President, "There's a fellow by the name of Rowan will find Garcia for you, if anybody can."

Rowan was sent for and given a letter to be delivered to Garcia. How "the fellow by the name of Rowan" took the letter, sealed it up in an oil-skin pouch, strapped it over his heart, in four days landed by night off the coast of Cuba from an open boat, disappeared into the jungle, and in three weeks came out on the other side of the island, having traversed a hostile country on foot, and delivered his letter to Garcia, are things I have no special desire now to tell in detail.

The point I wish to make is this: McKinley gave Rowan a letter to be delivered to Garcia; Rowan took the letter and did not ask, "Where is he at?" By the Eternal! there is a man whose form should be cast in deathless bronze and the statue placed in every college of the land. It is not book-learning young men need, nor instruction about this and that, but a stiffening of the vertebræ which will cause them to be loyal to a trust, to act promptly, concentrate their energies: do the thing—"Carry a message to Garcia!"

General Garcia is dead now, but there are other Garcias.

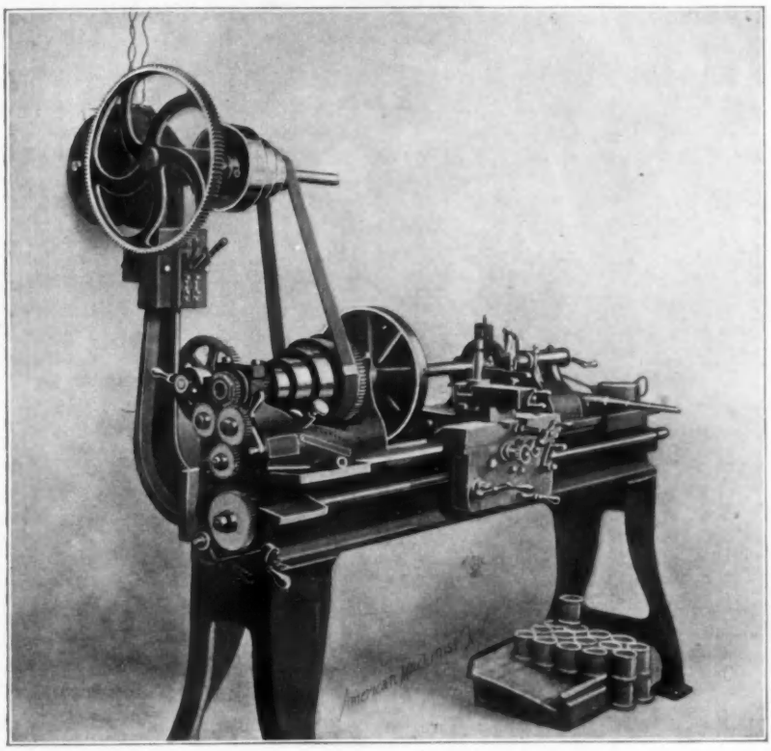


FIG. 7. MOTOR WITH ELASTIC SUPPORT ARRANGED FOR DRIVING A LATHE.

No man, who has endeavored to carry out an enterprise where many hands were needed, but has been well nigh appalled at times by the imbecility of the average man—the inability or unwillingness to concentrate on a thing and do it. Slipshod assistance, foolish inattention, dowdy indifference and half-hearted work seem the rule; and no man succeeds, unless by hook or crook, or threat, he forces or bribes other men to assist him; or mayhap God in His goodness performs a miracle, and sends him an angel of light for an assistant. You, reader, put this matter to a test: You are sitting now in your office—six clerks are within call. Summon any one and make this request: "Please look in the encyclopedia and make a brief memorandum for me concerning the life of Correggio."

Will the clerk quietly say, "Yes, sir," and go do the task?

On your life, he will not. He will look at you out of a fishy eye and ask one or more of the following questions:

"Who was he? Which encyclopedia? Where is the encyclopedia? Was I hired for that? Don't you mean Bismarck? What's the matter with Charlie doing it? Is he dead? Is there any hurry? Shan't I bring you the book and let you look it up yourself? What do you want to know for?"

And I will lay you ten to one that after you have answered the questions, and explained how to find the information, and why you want it, the clerk will go off and get one of the other clerks to help him try to find Garcia—and then come back and tell you there is no such man. Of course I may lose my bet, but according to the law of average, I will not.

Now if you are wise you will not bother

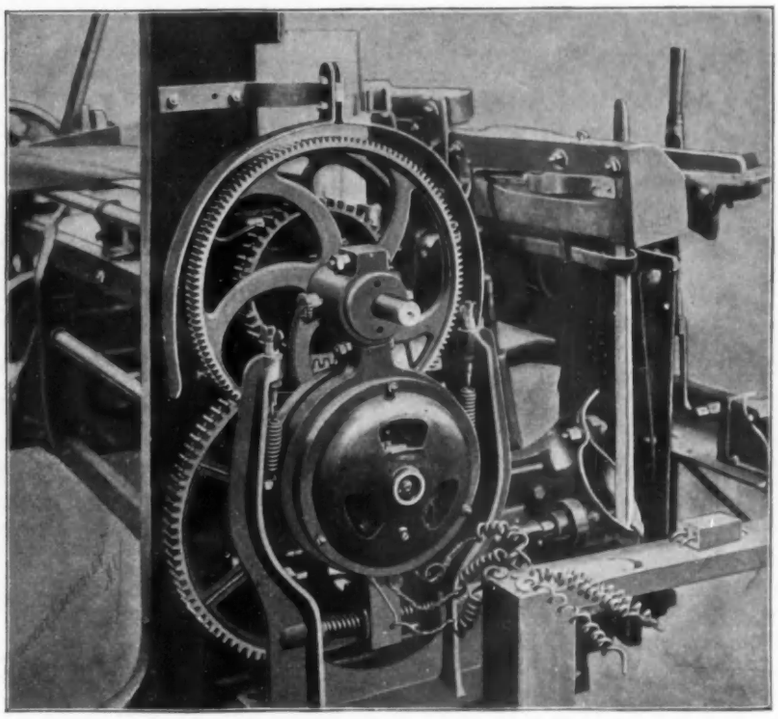


FIG. 8. MOTOR WITH ELASTIC SUSPENSION FOR DRIVING LOOMS.

to explain to your "assistant" that Correggio is indexed under the C's, not in the K's, but you will smile sweetly and say, "Never mind," and go look it up yourself.

And this incapacity for independent action, this moral stupidity, this infirmity of the will, this unwillingness to cheerfully catch hold and lift, are the things that put pure socialism so far into the future. If men will not act for themselves, what will they do when the benefit of their effort is for all? A first-mate with knotted club seems necessary; and the dread of getting "the bounce" Saturday night, holds many a worker to his place.

Advertise for a stenographer, and nine out of ten who apply can neither spell nor punctuate—and do not think it necessary to. Can such a one write a letter to Garcia?

"You see that book-keeper," said the foreman to me in a large factory.

"Yes, what about him?"

"Well, he's a fine accountant, but if I'd send him up town on an errand, he might accomplish the errand all right, and on the other hand, might stop at four saloons on the way, and when he got to Main street, would forget what he had been sent for."

Can such a man be entrusted to carry a message to Garcia?

We have recently been hearing much maudlin sympathy expressed for the "down-trodden denizen of the sweat-shop" and the "homeless wanderer searching for honest employment," and with it all often goes many hard words for the men in power.

Nothing is said about the employer who grows old before his time in a vain attempt to get frowsy ne'er-do-wells to do intelligent work; and his long, patient striving with "help" that does nothing but loaf when his back is turned. In every store and factory there is a constant weeding-out process going on. The employer is constantly sending away "help" that have shown their incapacity to further the interests of the business, and others are being taken on. No matter how good times are, this sorting continues, only if times are hard and work is scarce, the sorting is done finer—but out and forever out, the incompetent and unworthy go. It is the survival of the fittest. Self-interest prompts every employer to keep the best—those who can carry a message to Garcia.

I know one man of really brilliant parts who has not the ability to manage a business of his own, and yet who is absolutely

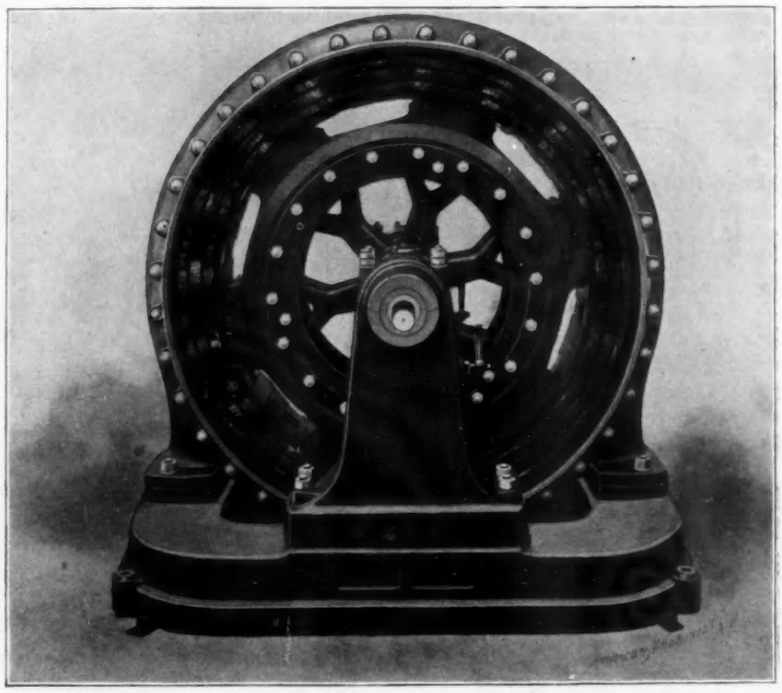


FIG. 9. 150 HORSE-POWER THREE-PHASE INDUCTOR GENERATOR.

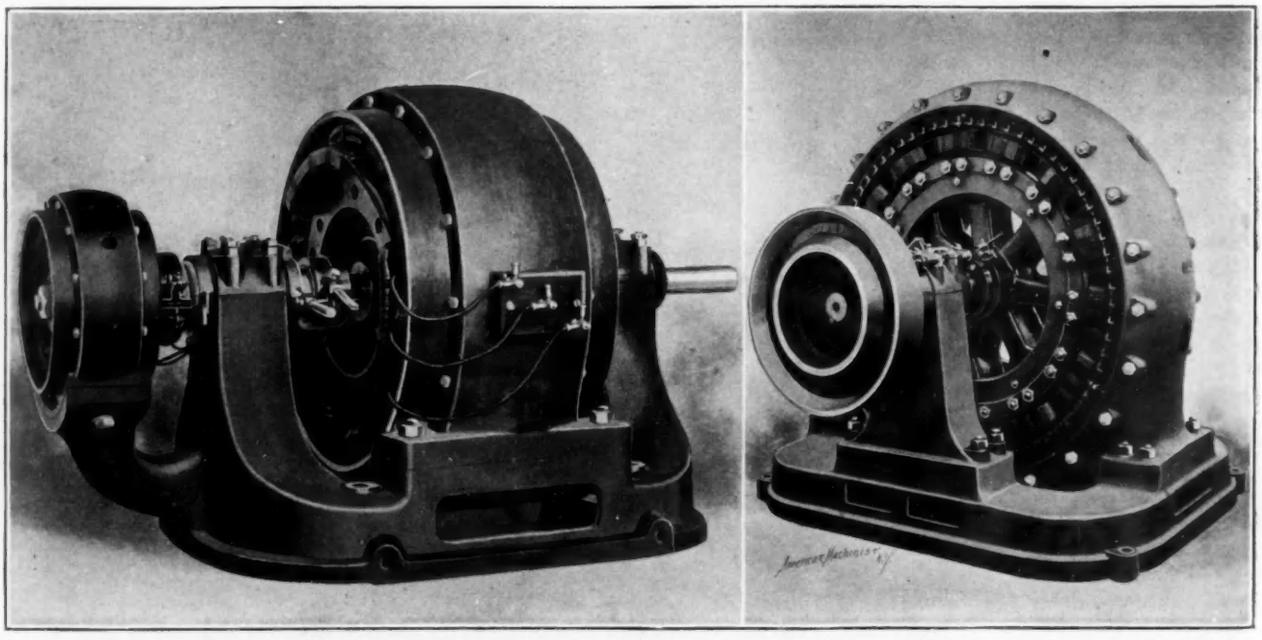


FIG. 10. 50 HORSE-POWER THREE-PHASE ROTATING-FIELD GENERATOR.

FIG. 11. 300 HORSE-POWER THREE-PHASE ROTATING-FIELD GENERATOR.

worthless to anyone else, because he carries with him constantly the insane suspicion that his employer is oppressing, or intending to oppress him. He cannot give orders; and he will not receive them. Should a message be given him to take to Garcia, his answer would probably be, "Take it yourself."

To-night this man walks the streets looking for work, the wind whistling through his thread-bare coat. No one who knows him dare employ him, for he is a regular fire-brand of discontent. He is impervious to reason, and the only thing that can impress him is the toe of a thick-soled No. 9 boot.

Of course I know that one so morally deformed is no less to be pitied than a physical cripple; but in our pitying, let us drop a tear, too, for the men who are striving to carry on a great enterprise, whose working hours are not limited by the whistle, and whose hair is fast turning white through the struggle to hold in line dowdy indifference, slip-shod imbecility, and the heartless ingratitude, which, but for their enterprise, would be both hungry and homeless.

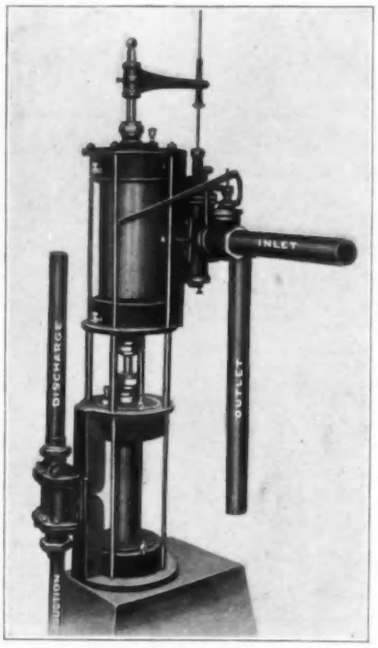
Have I put the matter too strongly? Possibly I have; but when all the world has gone a-slumming I wish to speak a word of sympathy for the man who succeeds—the man who, against great odds, has directed the efforts of others, and, having succeeded, finds there's nothing in it—nothing but bare board and clothes.

I have carried a dinner pail and worked for day's wages, and I have also been an employer of labor, and I know there is something to be said on both sides. There is no excellence, *per se*, in poverty; rags are no recommendation; and all employers are not rapacious and high-handed, any more than all poor men are virtuous.

My heart goes out to the man who does his work when the "boss" is away, as well as when he is at home. And the man who, when given a letter for Garcia, quietly takes the missive, without asking any idiotic questions, and with no lurking intention of chucking it into the nearest sewer, or of doing aught else but deliver it, never gets "laid off," nor has to go on a strike for higher wages. Civilization is one long, anxious search for just such individuals. Anything such a man asks shall be granted; his kind is so rare that no employer can afford to let him go. He is wanted in every city, town and village—in every office, shop, store and factory. The world cries out for such: he is needed and needed badly—the man who can carry a message to Garcia.

A Differential Hydraulic Pump.

The Ross Valve Company, of Troy, N. Y., has for several years manufactured a water engine for pumping church and other organs, and large numbers of them are in use in this country and elsewhere. The pump shown in the half-tone (which is made from an unsatisfactory photo) is the outgrowth of the organ-blowing engine. The pump, as will be seen, consists of two cylinders, not necessarily vertical, of different diameters and with the two pistons upon a single rod and working together. The larger piston drives the smaller, and the function of the engine is to pump water or other liquid against a comparatively high pressure by means of water at a low pressure in the other cylinder. The immediate suggestion arises that this service is precisely that of the hydraulic ram, and that therefore the present device is superfluous. The work of this pump is distinctly not the same as that of the hydraulic ram, and it performs a service impossible for the ram. The hydraulic ram is operated by running water, and delivers a portion of the same



A DIFFERENTIAL HYDRAULIC PUMP.

water against a greater pressure. This the pump will of course do, and more economically than the ram, but it is not in the least restricted to pumping the same water, and herein is its great advantage. The pump has been in use a sufficient time and in such a variety of service as to demonstrate its efficiency and reliability. It is operated by hard water for pumping soft water for domestic use. It is operated also by salt water for pumping fresh water, and by impure water for pumping pure water. It is used by cider makers to pump cider and vinegar by means of the city water supply, and also in a distillery to pump whisky from a lower floor to the upper stories by the same means. The water used for operating the pump is of course still serviceable for any purpose at the level of its discharge or below it.

The pump is exceedingly simple in construction, the valves being moved by the piston rod at each end of the stroke, and means being provided to make the movement certain at any speed. All the parts are easily accessible for examination, adjustment or repairs. The cylinders and pistons may be made of different metals, as best adapted to the liquids with which they are to be in contact, and the proportions of the cylinders may be whatever the relative pressures may call for.

The English Linotype Co.'s Works.

The works of the Linotype Company at Broadheath were formally "inaugurated" on July 14. Amongst those present at the ceremony were Lord Kelvin (who is one of the directors) and Lady Kelvin, Sir Joseph Leigh, Sir E. Leader Williams, Sir J. Verdin, Sir George Armstrong, Sir H. Gilzean Reid, Sir J. J. Jenkins, M. P., the Hon. Stilson Hutchins (Washington) and Mr. J. Lawrence, chairman of the company. After an inspection of the works, they were formally declared open by Lady Kelvin. Mr. Lawrence, who presided at the ceremony, said that the Duke of Connaught had expressed a desire to be present, but was unfortunately unable to come. A letter of regret had also been received from Lord Rosebery, who hoped to inspect the works on some future occasion. Mr. Lawrence said the object of the gathering was to put a seal on the efforts they had been making during the last ten years to create a great industry in England. The linotype machine had revolutionized the English printing industry. Ten years ago, when Mr. Gladstone saw the machine, he said it would do as much for mankind as the repeal of the taxes on knowledge, and Mr. Gladstone's forecast had been rapidly realized. The capital represented by the industry in all its phases, in this country and in America, was close on ten millions sterling. He added that the introduction of the new machine had not involved, as was at first feared, a great displacement of labor; so far from inflicting an injury on compositors, it had benefited them in many ways—their hours of labor were shorter and their wages higher. Lord Kelvin was among the other speakers. He described the linotype machine as a triumph of American and English inventive genius. Our friends on the other side of the Atlantic had, he said, a degree of inventive genius and a practical way of bringing it into use which we had scarcely yet reached in this older country. But he could hardly conceive anything more important in respect to the Anglo-American alliance than friendly co-operation in work of this kind. Looking at the machines from his own point of view, he was delighted with the splendid combination of inventive idea with mathematical and scientific accuracy.—"Practical Engineer."

The General Arrangement and Connection of Apparatus on Switchboards—II.

BY WM. BAXTER, JR.

In comparing the switchboards illustrated in Figs. 1 and 3, we can see several marked differences; for example, the first is provided with an equalizing bus-bar, while the second one is not; nevertheless, both are properly arranged to connect the equalizing wires of the generators when the latter are required to operate in parallel relation. In Fig. 3 the center connecting blade of the S'' switch plays the part of an equalizing bus. This arrangement is not adapted to Fig. 1, owing to the fact that the generators are not required to operate separately, but at all times feed into the same system of distributing circuits. Fig. 1 has a double set of bus bars, and before the current can pass to the distributing circuit it is necessary to close the S'' switch; and this is true, whether the current is derived from the generators or from the street mains. Upon examining the diagram it will be found that the second set of bus bars become necessary in order to be able to take current from the three-wire street system. If the S_1 switches were connected directly with the lower set of buses, they would operate well enough when taking current from the street; but when supplied from the generators they would not, for then all the lamps, or motors, connected between the E bus and the top one (P bus) would be practically connected with the same end of the line, and would therefore not receive any current worth mentioning, as the voltage acting upon them would be practically nothing. When the S'' switch is thrown to the left it connects only the top and bottom buses of the lower set with those of the upper set, and as with this connection the center upper bus is the positive side of the generators and the top and bottom buses are the negative side, all lamps connected between the center and either of the two N buses will get the proper voltage when the current is derived from the generators, and also when the street supply is used.

In Fig. 1 the ammeters are connected in the circuit, so that all the current of each generator passes through its respective instrument; but in Fig. 3 the ammeters that measure the current of the generators are so arranged that only a portion of the main current passes through them. Tracing the lines $x\,x$ and $x'\,x'$ it will be seen that they lead to the ends of blocks marked St. These blocks are shunts and are for the purpose of diverting a portion of the current through the ammeter. The twelve ammeters in the branch circuits are arranged as in Fig. 1 so that the whole current passes through them. If we look at circuit breaker switch No. 3 we will find that its top terminal is connected with the No. 3 ammeter, the other terminal of this in-

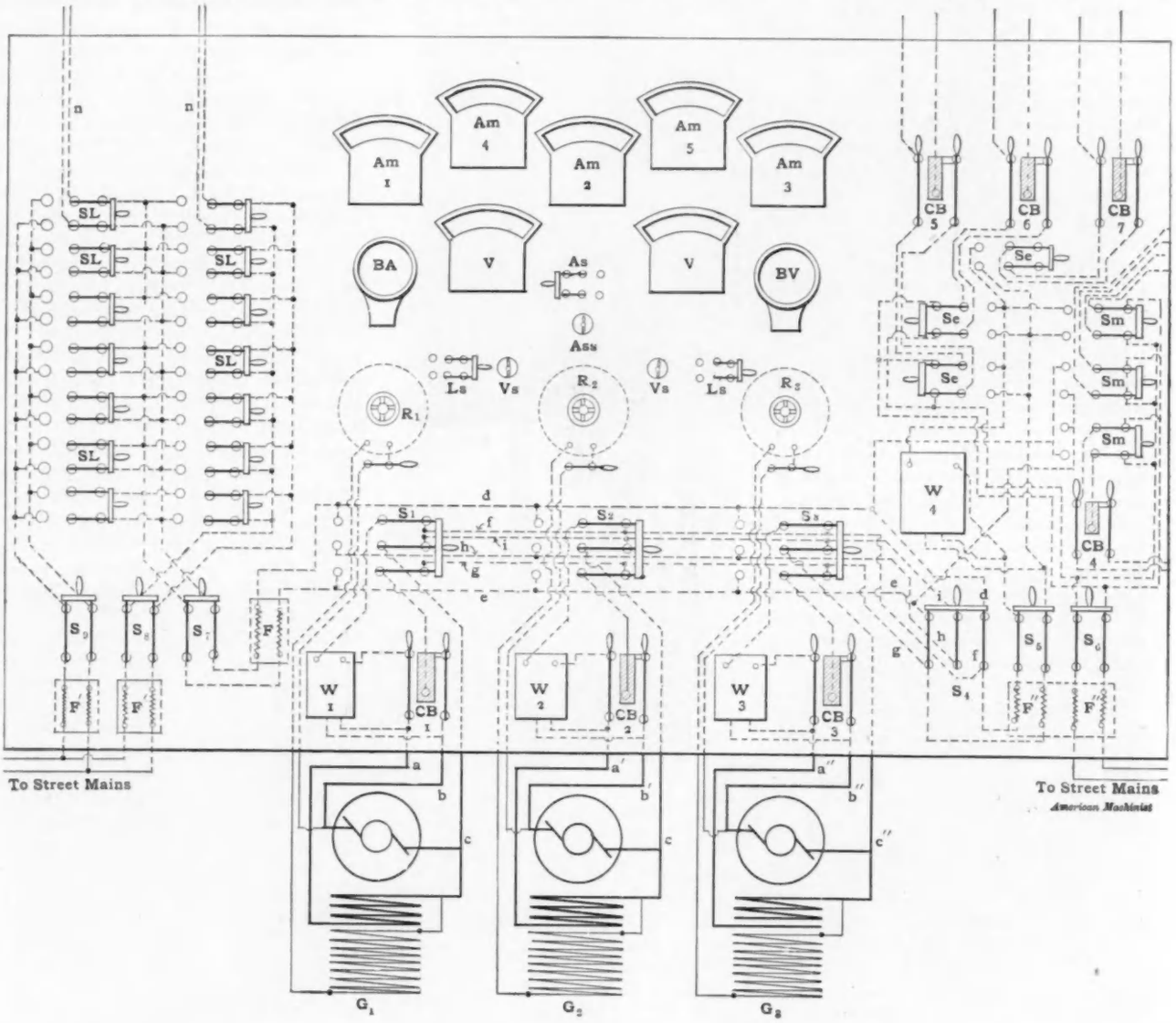


Fig. 4

DIAGRAM OF THE FRANKLIN BUILDING SWITCHBOARD.

strument passing directly out to the external circuit. The other side of this circuit comes down to the center terminal of the No. 3 circuit breaker. The ammeters in the branch circuit are connected so that the whole current passes through them, because they are of small capacity, compared with the instruments that measure the main currents. The connections on switchboards are generally made with bars that have a cross section of 1 square inch for each 1,000 amperes, and from this it can be seen that to connect ammeters of large capacity directly in the circuit would require the use of large conductors. When the shunts *St* are used, the current passing to the instrument need not be more than a small fraction of 1 per cent., hence, it can be carried in small wires.

Fig. 4 shows the arrangement of circuit connections and instruments upon the switchboard of the Franklin Building, New York City, which we are enabled to present with a photographic view of the front, Fig. 5, through the courtesy of the builders, Messrs. A. La Roach & Co. This board is of recent construction, and is generally regarded as one of the best examples of modern switchboard engineering practice. It is arranged to connect three generators with two systems of contributing circuits, one being used for lighting and the other for power. These circuits are also arranged so as to be fed from the street mains, and the connections are such that at any time a part of the system can be operated from the street mains and the balance from the generators. Any one of the generators can be connected with the entire system of circuits, or the power and light portions may be run separately, two generators furnishing current for one part, and the other generator supplying the remainder. The way in which these results are accomplished can be readily understood from the following description:

The three generators are connected with the system in the same order; hence, the description of the connections of one will answer for the other two. Looking at the generator *G*1 it will be seen that the lines *a* and *b* run to the lower terminals of the circuit breaker *CB*1. Line *c*, which is the equalizing connection, runs to the center terminal of the *S*1 switch, directly above the circuit breaker. The center terminal of the circuit breaker is connected with the lower center terminal of the *S*1 switch, and the top circuit breaker terminal connects with the rectangle marked *W*1, which is a wattmeter. From the other terminal of this wattmeter a connection runs to the top center terminal of the *S*1 switch, thus connecting the three center terminals of this switch with the generator terminals.

When the *S*1 switch is thrown to the right side, as shown in the diagram, bus *g* is connected with the center terminal of the circuit breaker, and this through the right-side lever, is connected with the generator lead *b*. In the same way bus *f* is connected through the wattmeter and the circuit breaker with generator lead *a*, and bus *i* is connected directly with lead *c*. From this it will be seen that bus *i* is an equalizing bus. When the *S*1 switch is thrown to the left generator lead *a* is connected with bus *d*, and lead *b* with bus *e*, while the equalizer lead *c* is connected with bus *h*. Thus when the switch is thrown in opposite directions it connects the generator terminals with two different sets of buses, and in these two sets *h* and *i* are equalizing buses, while *d* corresponds to *f*, and *e* to *g*.

If we follow the buses *e* and *d* to the left we will find that they run to a rect-

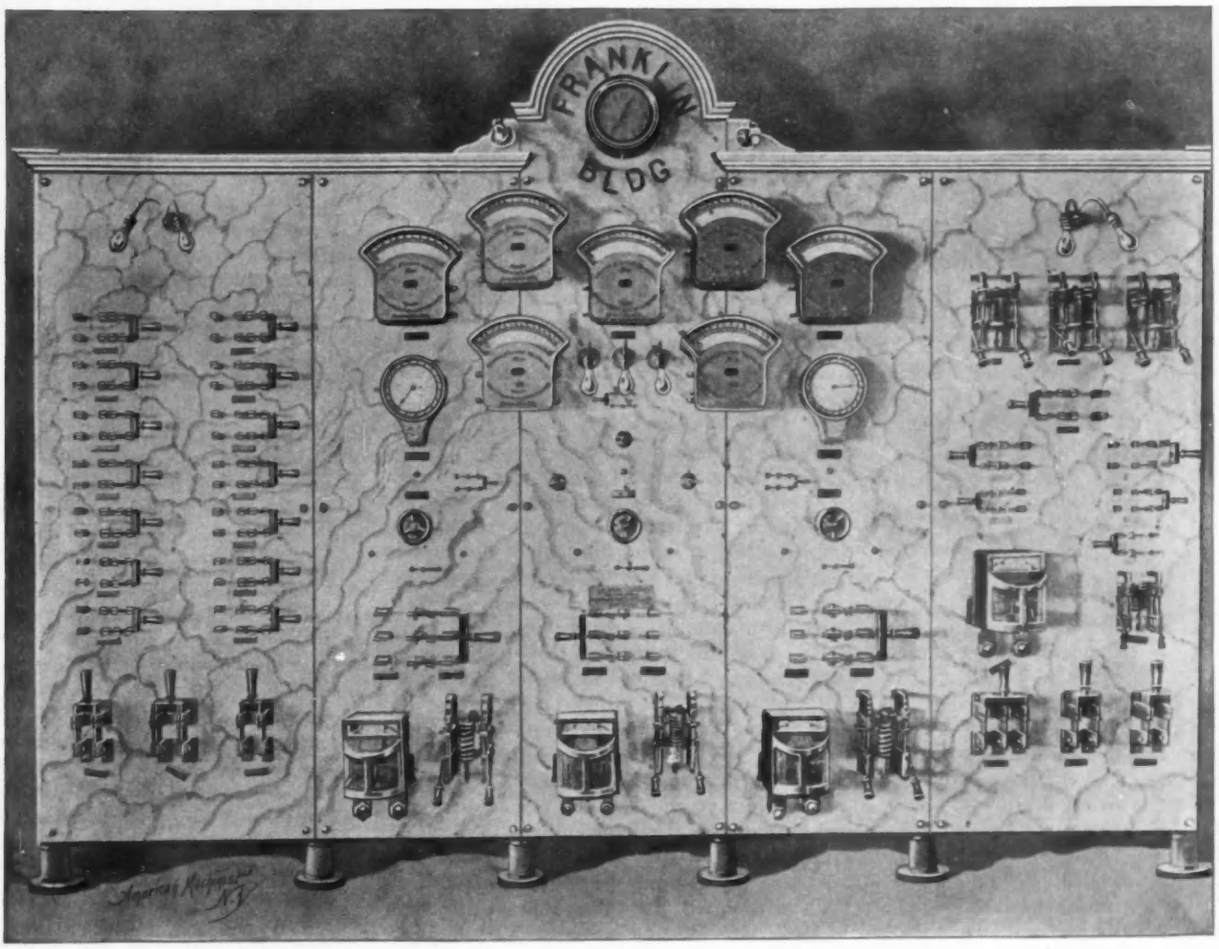


FIG. 5. THE FRANKLIN BUILDING SWITCHBOARD.

angle F, which is a double pole safety fuse, and from here to a switch S_7. From this last switch lines run up that connect with fourteen smaller switches marked $S\,L$. Each one of these switches feeds into a lighting circuit, only two of which, marked $n\,n$, are shown, to avoid confusion. Adjoining the switch S_7 are two other switches S_8 and S_9, and these are connected through the safety fuses $F'\,F'$ with the street mains. Switch S_8 is connected with one row of the $S\,L$ switches, and switch S_9 with the other row. The $S\,L$ switches are of the double-throw type, and when turned in one direction connect the lighting circuits $n\,n$ with the street mains, and when turned in the other direction connect them with the buses e and d. If the switches S_8 and S_9 are closed, any one of the $S\,L$ switches can be turned so as to take current from the generators or from the street.

If we follow the e and d buses to the right we will find that they lead to two of the switches marked Sm and also to the top side terminals, of the switch S_4. Following the g and f buses we find that they run to the lower corner terminals of the S_4 switch, and from here to the safety fuse F'' and the switch S_5. From the upper right-side terminal of the S_5 switch a connection runs to the three Se switches and also to the top Sm switch. From the left side upper terminal of the S_5 switch a connection runs to the wattmeter W_4, and from this a connection runs to the Se switches and to the top Sm switch. Thus it will be seen that through switch S_5 and wattmeter W_4 the g and f buses feed the Se switches and one of the Sm switches. The street mains, coming in at the right side of the board, lead through switch S_6 to the three Se switches, and also to the three Sm switches; hence, the circuits controlled by these switches can be fed from the generators or from the street mains. The circuit controlled by the lower Sm switch is provided with a circuit breaker, $C\,B_4$, and the three circuit breakers $C\,B_5$, $C\,B_6$, $C\,B_7$ protect the circuits controlled by the Se switches. These latter switches are in circuits that operate passenger and freight elevators.

If the switch S_4 is opened, there is no connection between the $d\,e$ and $f\,g$ buses. Therefore, under this condition the three generators can be connected all with one set of buses, or one with one set and the remaining two with the other set of buses. If the S_4 switch is closed, bus g will be connected with bus e, and bus f with bus d, while the two equalizing buses, i and h, will be connected through the center blade. With this connection the three generators will feed into the whole system and the two sets of buses will become practically one set. In each set of buses there is an equalizing connection, so that two or more generators may be connected with that part of the system.

Under ordinary circumstances it is desirable to keep the power and light circuits separate, as the sudden changes in the current taken by the motors tend to unsteady the voltage too much for the successful operation of the lights, but by having two parts of the system so arranged that they can be joined into one, it becomes possible to operate the entire plant with greater economy at times when the full capacity is not required. Suppose that at some time a small number of lights were in use on all the various branches of the system, but not enough in the aggregate to absorb more than a portion of the capacity of one generator, and at the same time suppose that the demand in the power circuits were also very low, then if the two parts could be connected in one, a single generator might be capable of doing the whole work, but if each part had to remain separate, two machines would have to be kept in service.

In this installation the wires leading in from the street are only two in each circuit, owing to the fact that the lamps in use are of the 220-volt type; hence, they can be fed from the outside wires of the three-wire street system. As all the $S\,L$, Se and Sm switches are of the double-throw type, any one of the branch circuits can be fed from the street mains or from the generators, and if the switches S_6, S_8, S_9 are kept constantly closed, the change can be effected instantly.

The ammeters 1, 2, 3 are connected with the three generators and are of the shunt type. The ammeter Am_4 is so arranged that it can be cut into any of the circuits leading from the $S\,L$ switches, and thus render it possible to measure the current in these branches at any time. The shifting of this instrument to the various circuits is accomplished by the aid of the switch Ass, the switch proper being back of the board, the part seen being simply the handle. The ammeter Am_5 is arranged so as to be connected in the power circuit or the light circuit, and is controlled by the double throw switch As. The two voltmeters are so arranged that one will indicate the voltage of the power circuit and the other that of the light circuit. When a generator is cut into service one of the voltmeters is used to indicate the voltage of the buses with which it is to be connected, and the other connects with the generator terminals. Thus the two voltages can be equalized before the generator switch is closed.

$B\,A$ and $B\,V$ are recording instruments, the first being an ammeter and the second a voltmeter. These instruments trace a line upon a cardboard dial, just like a recording steam gage. The wattmeters W_1, W_2, W_3, W_4 are sometimes called recording wattmeters, but they are more properly called integrating meters, for they indicate the sum total of the electrical energy that has passed through them up to the time of reading. The Ls switches are for the purpose of turning on or off the lights that illuminate the switchboard. The voltmeters are controlled by the switches whose handles are shown at Vs Vs. The field regulators are shown at $R_1R_2R_3$. The switch seen below each regulator is for the purpose of opening the circuit through the shunt field of the generator, but as there is nothing to be gained by being able to open this circuit, and as it may produce serious results, the introduction of this switch cannot be recommended.

Finding the Position of the Crank When the Position of the Piston or Cross-Head is Given.

BY PROF. MICHELE FERRERO.

We know that the position of the cross-head K, Fig. 1, of a connecting rod $K\,M$, when we imagine the connecting rod to be infinitely long, is given by the projection P of the pin M on the diameter $M_1\,M_2$ of the crank-pin circle. If the connecting rod cannot be considered as having an infinite length, the position of the cross-head is given by the circular projection Q of the pin M on the diameter $M_1\,M_2$, obtained by a circle having its center in the cross-head K and a radius equal to the length of the connecting rod.

In the solution of valve-gear problems we have often to determine the position of the crank, having given the position P or Q of the piston. But drawing the perpendicular $P\,M$ or the arc of a circle $Q\,M$, when the point P or M is very near to the end of the stroke, does not give a satisfactory result, because this perpendicular or this arc cuts the circumference of the crank pin at too small an angle. Moreover, being obliged to draw circumferences with such a large radius as L gives another occasion to make graphical errors.

The position $O\,M$ of the crank for a given position P or Q of the cross-head can be located with great precision, drawing, instead of the perpendicular $P\,M$ or the circumference $Q\,M$, the chord $M_1\,M$ of the arc described by the pin M, and this chord must be calculated.

First—The connecting rod is supposed to be infinitely long, Fig. 2.

Let $O\,M = R$ be the position of the crank corresponding to the position P of the piston. Draw $M\,M_1$ and $M\,P$. We know that

$$\overline{M_1\,P}\ (2\,R - \overline{M_1\,P}) = \overline{P\,M}^2,$$

or that

$$2\,R \cdot \overline{M_1\,P} = \overline{P\,M}^2 + \overline{P\,M_1}^2 = \overline{M\,M_1}^2. \quad (1)$$

Dividing by $\overline{2\,R}^2$ and taking the square root, (1) becomes:

$$\frac{\overline{M_1\,M}}{2\,R} = \sqrt{\frac{\overline{M_1\,P}}{2\,R}}$$

Hence the chord $M_1\,M$ of the arc described by the pin M, expressed in terms

of the stroke $2R$, is equal to the square root of the space M_1P described by the piston or cross-head, likewise expressed in terms of the stroke. Therefore when the space $\frac{\overline{M_1P}}{2R}$ is given, the position of the pin M is determined by cutting the circumference $M_1 g M_2$ with a circle having the center in M_1, the radius being equal to the square root of $\frac{\overline{M_1P}}{2R}$.

Example: If we look for the position of the crank corresponding to a movement of the piston of 1-100 of the stroke we shall draw with the center in M_1 an arc having a radius equal to 1-10 of M_1M_2.

Second—The connecting rod is of the length L, Fig. 3.

Having given the space $\frac{\overline{M_1Q}}{2R}$ described by the piston from the end of the stroke M_1, we can determine the corresponding

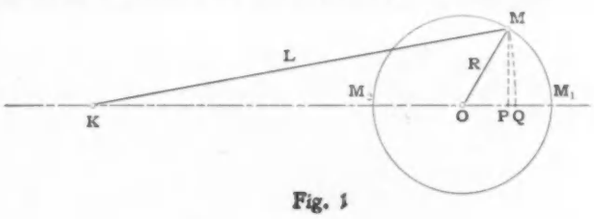


Fig. 1

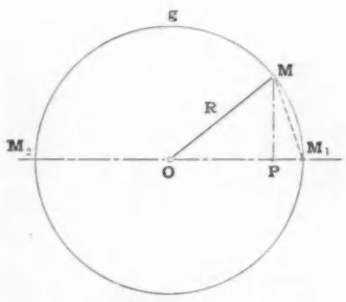


Fig. 2

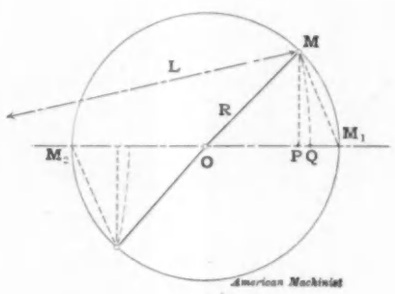


Fig. 3

THE CRANK AND CROSS-HEAD PROBLEM.

position OM of the crank by first finding the space $\frac{\overline{M_1P}}{2R}$ which would have been described by the piston, if the connecting rod had been infinitely long, for the same rotation of the crank. The square root of $\frac{\overline{M_1P}}{2R}$ will then be the value of the chord M_1M in terms of the stroke.

If we measure distances from the end of the stroke M_1 farther from the cylinder we have: $\overline{MP}^2 = \overline{M_1P}\ (2R - \overline{M_1P})$
$= PQ\ (2L - PQ)$,

and dividing by $\overline{2R}^2$, we obtain:

$$\frac{\overline{M_1P}}{2R}\left(1 - \frac{\overline{M_1P}}{2R}\right) = \frac{PQ}{2R}\left(\frac{L}{R} - \frac{PQ}{2R}\right)$$

which, since

$$\frac{\overline{PQ}}{2R} = \frac{\overline{M_1P}}{2R} - \frac{\overline{M_1Q}}{2R}$$

becomes:

$$\frac{\overline{M_1P}}{2R}\left(1 - \frac{\overline{M_1P}}{2R}\right) = \left(\frac{\overline{M_1P}}{2R} - \frac{\overline{M_1Q}}{2R}\right)\left[\frac{L}{R} - \left(\frac{\overline{M_1P}}{2R} - \frac{\overline{M_1Q}}{2R}\right)\right]$$

giving:

$$\frac{\overline{M_1P}}{2R} = \frac{\frac{\overline{M_1Q}}{2R}\left(\frac{L}{R} + \frac{\overline{M_1Q}}{2R}\right)}{\frac{L}{R} + \left(2\,\frac{\overline{M_1Q}}{2R} - 1\right)} \qquad (2)$$

If we measure distances from the end of the stroke M_2 nearer to the cylinder we find in the same way:

$$\frac{\overline{M_2P}}{2R} = \frac{\frac{\overline{M_2Q}}{2R}\left(\frac{L}{R} - \frac{\overline{M_2Q}}{2R}\right)}{\frac{L}{R} - \left(2\,\frac{\overline{M_2Q}}{2R} - 1\right)} \qquad (3)$$

The square root of $\frac{\overline{M_1P}}{2R}$ or of $\frac{\overline{M_2P}}{2R}$ will give us the length of the chord $\frac{\overline{M_1M}}{2R}$ or $\frac{\overline{M_2M}}{2R}$ and the problem is reduced to the former case.

Example: Let $\frac{L}{R} = 5$ and $\frac{\overline{M_1Q}}{2R} = \frac{1}{100}$; giving.

$$\frac{\overline{M_1P}}{2R} = \frac{\frac{1}{100}\left(5 + \frac{1}{100}\right)}{5 + \left(2 \times \frac{1}{100} - 1\right)} = \frac{1}{80.2}$$

and $\frac{\overline{M_1M}}{2R} = \sqrt{\frac{1}{80.2}} = \frac{1}{8.96}$.

The first case can be also applied to the motion of a piston which is driven by a connecting rod of a certain length, if we use the diagram of Brix.

Royal Engineering School, Turin, Italy.

The Crouch Steam Wagon.

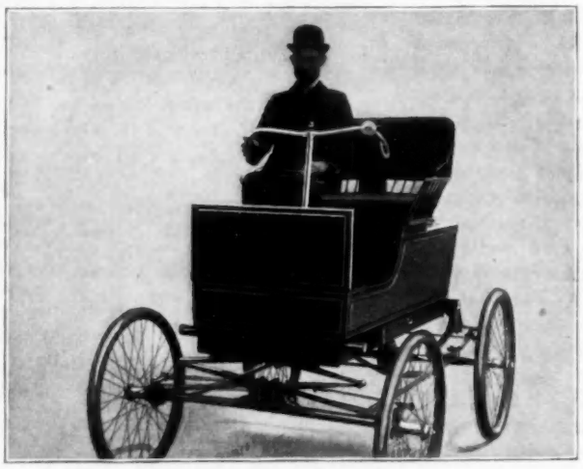
While the steam road wagon has the enormous disadvantages of requiring a steam boiler, a lot of water and a strong fire, all highly objectionable elements in themselves and full of difficult problems even in the steamship and railway locomotive, and seemingly altogether unsuitable for a light and elegant private carriage suited to the transportation of two or four passengers, the steam engine has so many virtues as a motor that its advantages appear to far overbalance all drawbacks, and it is certain that nothing short of a long test of actual use can decide between the steam engine and the internal combustion engine, as to which is the more suitable for road wagons.

The internal combustion engine has no boiler, no water and no fire, in the ordinary meaning of the word. But it can run only one way, and unless working at full power and full speed is uncertain in action. The motor wagon must be driven forward and backward both, and must have a motor that can give little or much driving impulse at high or low speed, as the occasion demands, and the steam engine can meet these requirements in a way which cannot possibly be approximated by the internal combustion engine taken alone. I myself fully believe that the gas engine will be the finally accepted motor for the automobile at large, but no one yet knows what adjuncts must be supplied to the internal combustion motor to make it equal in readiness of action and change in effect to the steam engine. At the present moment it must be confessed that no gas engine driven wagon can compare with the steam-driven wagon for certainty and perfection of action.

W. Lee Crouch, formerly of the Pierce-Crouch Gas Engine Company, New Brighton, Pa., made many inventions in gas engines, produced an excellent motor of that class, and placed one of his gas engines in Dr. Booth's motocycle, which was one of the best first attempts ever made in automobiles. But when it came to a wagon for himself and for a serious business venture, Crouch, who is a thorough engineer, both in theory and practice, turned the cold shoulder to the gas engine, built a steam wagon in two months from the time he began work on it, sold his interest in the Pierce-Crouch gas engine factory, and organized a company at Baltimore, Md., where he is just now equipping a fine factory for the production of steam wagons.

The commercial model of the Crouch steam wagon for two and four passengers has not yet advanced beyond the drawing board. It will have vertical engines and a vertical boiler, with a chain power transmission to the driving axle, all in the highly meritorious manner of Hancock, 1832, in his renowned steam carriage, the "Infant," which was a commercial success in carrying passengers between London

and Stratford, and in 1836 Hancock ran four or five of his steam carriages, the "Infant," "Eva," "Enterprise," "Autopsy" and perhaps one or two others, on the Paddington road, London, daily without intermission for upward of five months, reaching forward and upward to the crank-shaft pillow blocks, in the extreme forward end of the wagon body, under the driver's foot-board. The under frame is composed of the front and rear axles, to which are jointed two widely boiler a superheating helical steam delivery pipe leads from the top of the steam space downward through the hottest part of the fire, and delivers steam to the steam jackets of the cylinders at a pressure of from 250 to 300 pounds, and at a



CROUCH IN HIS STEAM WAGON.

CROUCH STEAM WAGON REAR AXLE.

during which time he covered 4,200 miles and carried a vast number of passengers without accident. The Whitney and Stanley steam wagons use Hancock's general arrangement of boiler and engines. Crouch, in his first and up to now only wagon, placed his engines horizontally, but his commercial model will fall into Hancock's standard form.

separated reach members. The elliptic springs carry wooden bolsters, to which the top frame, also of steel tubing, is secured. The rear end of this top frame carries the vertical helical water-tube boiler, while the side tubes of the top frame carry the cylinders and guides, all

temperature of from 750 to 800 degrees. This gives dry steam and ensures the Crouch engines against cylinder condensation, which is an essential feature, as Crouch uses an adjustable cut-off and permits steam at boiler pressure to follow his pistons for only from 1-20 to 1-10 of

CROUCH STEAM ENGINE. DRIVER'S FOOT-BOARD REMOVED. VIEW FROM RIGHT SIDE.

CROUCH STEAM ENGINE. DRIVER'S FOOT-BOARD REMOVED. VIEW FROM LEFT SIDE.

The illustrations show that it is easy, even with horizontal engines, to give a steam-driven carriage the form of ordinary American vehicles, and without a doubt the ordinary forms of horse-drawn vehicles are the best forms for automobiles.

The Crouch wagon framing comprises two rectangular structures, placed one above the other, connected by the elliptic springs and braced by a double inclined strut, journaled to the rear axle and as pretty well shown in the illustrations herewith.

Crouch adopts the vertical helical water-tube boiler because of safety and because the water-tube boiler demands the fierce circulation which is natural to water confined in narrow spaces and rapidly heated. The cylindrical boiler filled with flues demands repose for the water it contains, because if the water moves much wet steam results. It also seems to be easier to apply efficient means for superheating the steam to a water-tube boiler than to a vertical flue boiler. In the Crouch

the stroke on a level road. The cylinders in this first wagon are 3-inch bore by 6-inch stroke, and yet it can easily draw a trailer with four additional passengers and take without difficulty any hill over which horses can work.

The Crouch wheels are wire suspension, with steel rims; front 32 inches diameter, with 2-inch "Diamond" pneumatic tires; rear 34 inches diameter, with 2½-inch tires. There seems to be no good reason for two diameters of wheels and two diameters of tires on a light wagon. The wheel gage is 54 inches, and the wheel

base is 60 inches. This wagon has all plain sliding bearings everywhere, no ball bearings whatever being used. The power transmission is by a hard roller, Boston Gear Works chain, 1⅛-inch pitch. The sprockets are of cast iron, with cut teeth, 16 teeth on the engine shaft and 24 teeth on the compensating gear disk. The compensating gear is of bronze, about 8 inches outside diameter, and the two pinions are about 2 inches outside diameter. This gear will be enclosed in the commercial model, as well as all other working parts of the machinery. This Boston Gear Works chain is considered very satisfactory.

The Crouch engines have puppet valves in the cylinder heads, with tool-steel hardened cams to operate them, and a hand-controlled variable drop cut-off, operating from 0 to ¾ stroke. The reverse is by a shifting eccentric on the main shaft. Crouch asserted that with his dry superheated steam, hot cylinders and quick cut-off, he could show a brake horse-power with 18 pounds of water per hour, and whether he can actually attain this extremely low weight of steam or not, his engines certainly impressed me as being the very best small steam engines I had ever seen. All the valve work is in sewing-machine-part weights, which makes the tool-steel hard cams not only possible but perfectly satisfactory in action, and the quantity of steam used is so small that at no time did I observe any visible exhaust. The exhaust is through a closed-end pipe, perforated with 40 holes 3-32 inch diameter, and is not audible.

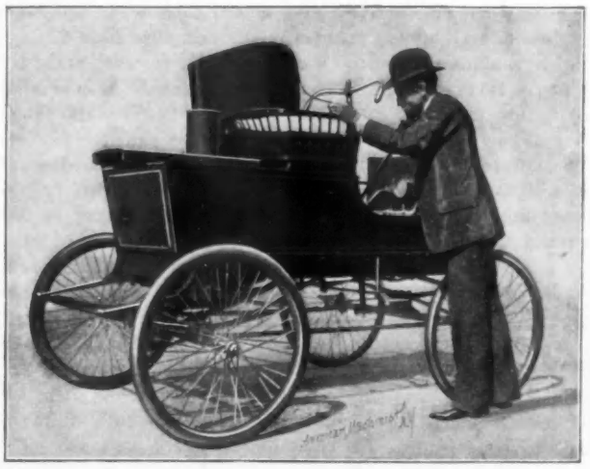
The boiler is made of commercial steel tube, 13-16 inch outside diameter by ⅝ inch inside diameter. The outer casing is 13½ inches inside diameter by 36 inches high, and the bottom of the firebox is 22 inches above the road surface. The fire is made by two Bunsen burners, set to give opposed impinging flames; it makes a very little roaring, hardly audible, and is almost entirely without odor. The boiler weighs about 120 pounds, has 35 square feet of heating surface; can evaporate from 120 to 200 pounds of water per hour.

The boiler is fitted with a horizontal smoke-stack, live steam jet blower, pop safety valve set at 300 pounds, and an exterior water column, which takes the feed water and contains a float which operates on the pump suction. The pump has ordinary check valves which do not always work, and Crouch told me he would have two pumps in his commercial wagon, with mechanically-actuated valves. He said this very earnestly as he stood on the ground pumping up his boiler by hand against 200 pounds pressure, in Druid Hill Park.

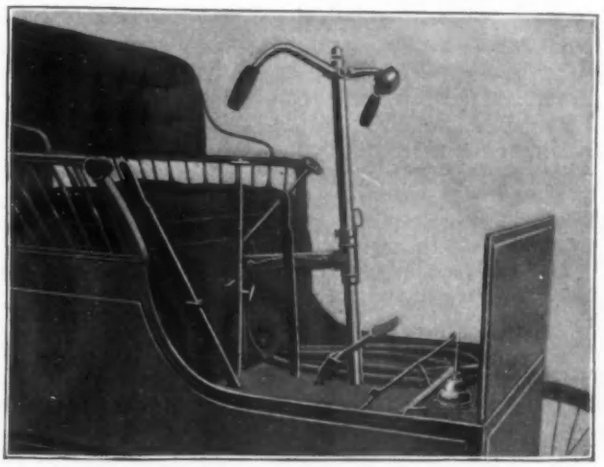
Mr. Crouch, like many other highly intelligent young men, has passed much of his life in a machine shop, and has no idea that there is anything seriously objectionable in oil cans and machine grease, and rubber hose and hand wheels and things of that sort; hence the appearance of the driver's seat and foot-board of his present steam wagon is easily accounted for. When Crouch fully understands what the public really wants in a motor carriage, the driver's seat and foot-board of his steam wagons will probably not have so distinctly a machine shop aspect as is shown in the picture.

The present wagon has a bicycle steering bar, a brake treadle, cut-off regulating lever, steam throttle-wheel, fuel valve wheel, and a live steam jet-wheel under the driver's manipulation. A hand air pump, an oil can and a water supply hose are also visible. The hose is connected to the water tank by a steam siphon, and by dropping the free end of the hose into a water supply the water tank can be filled very quickly. The water tank holds 10 gallons only. The boiler requires from 1¼ to 2 gallons of fuel, gasoline or kerosene per hour. The total weight of this wagon is 1,040 pounds without passengers.

HUGH DOLNAR.



MR. CROUCH PUMPING UP HIS BOILER AGAINST 200 POUNDS PRESSURE.



CROUCH WAGON. DRIVER'S SEAT, LEVERS, HOSE, OIL-CAN, ETC.

Letters from Practical Men

Fixing up a Planer—Heavier Pinion Shafts.

Editor American Machinist:

The letter from your correspondent "Planer," in your number of July 20, reminds me of an experience of my own many years ago in the same line, and I am moved to write about it from the fact that my experiment was a success, while "Planer" seems a little in doubt as to the final outcome of his.

My case was a planer 9 or 10 feet wide between posts, afflicted much the same as that of your correspondent. By getting under it I found that the trouble was in the springing or surging of the shaft of the first pinion, that which works into the big gear underneath; and I think "Planer" will find that is the trouble before he is through.

I laid out for a tool steel pinion and shaft in one piece, but found that in order to get them in place a coupling like that on a propeller shaft was needed. The teeth were planed to a template fitted in the old cast-iron pinion, with a trifle more clearance at the points.

The shaft part came about 7 inches diameter, the full size at the bottom of the tooth, and the coupling flanges about 12 inches. The journals came as they were—about 4 inches.

On trial the effect was a surprise to me at least, for here was a planer which had been condemned for weakness in the bed working as smoothly as a Sellers.

It is a very common habit for designers to make second-motion shafts very much weaker than the first, for the reason that the torsional or twisting strain is less. Thus we frequently see a small pinion shaft with the pinion even overhung to make the trouble worse, say on a big lathe with a face-plate gear.

The above reasoning, however, is in-

correct, as I shall proceed to show, casting no blame upon the many who have not had my opportunities for observation and experiment.

The most troublesome strain to take care of is the transverse, or cross strain, deflecting or springing or breaking spindles and shafts. The torsional strain is the least troublesome, as it merely tends to rotate the shaft or twist it bodily through a small angle.

The transverse strain may be measured in pounds pressure or weight acting at the point of contact of the gear pitch circle and the pinion pitch circle, and in a line at right angles to the line joining the centers.

Now the pressure on the pinion teeth is equal to that on the gear teeth, and the pressure on the face-plate gear equal to that on the spindle. Consequently the transverse strain on the pinion shaft is equal to that on the lathe spindle, but in an opposite direction.

The above, however, is only a demonstration in geometry, and I ask no man to accept it without practical proof, which I will now give.

A large gun lathe called a 120-inch was troubled with the hitching along motion, especially when taking a light cut with a wide tool, much as described by "Planer." So, as gun iron was handy, I had a pattern made with pinion and shaft in one piece and molded on end, so as to draw the pinion, and the mold dried.

The shaft and its journals I made as large as the pinion over the teeth, and put the inside bearing outside the pinion on the bed so that the pinion would not overhang, which had been one of the defects at first.

These things together saved the lathe, which had been contracted for as subject to the final approval of the United States inspectors; but as they had previously approved the drawings, compensation was sought and finally obtained for the extra work which I have indicated.

Mr. John Richards and Mr. Sweet have written very ably for many years in favor of heavy bed plates, but I do not remember anyone who has said anything about heavy pinion shafts.

WILLIAM H. HARRISON,

Braintree, Mass.

Importance of Tools.

Editor American Machinist:

The history of the last few years of the "cycle" trade contains some object lessons worthy of study. The writer has in mind one firm (and we all know of others) who, having become rich in agricultural work when that field was "virgin soil," entered upon the business of building wheels in the same spirit. Having capital, business connections, an excellently organized selling force and agencies already established, everything pointed toward success. The first year they cleared expenses, second year made money, third year lost money, fourth year lost more, and now are on the eve of dissolution.

Though they will not believe it, the cause of their failure was simply a lack of appreciation of modern tools and fixtures and willingness to pay wages commensurate with the ability of men to make and use them.

The workman most valuable to manufacturers is, of course, one who can turn out the most work, but every factory needs a few men (and needs them badly) whose ideas and suggestions for improved methods will help to systematize methods; to make or to suggest ways of making work better, cheaper and quicker.

The gas engine being practically in its infancy is, generally speaking, far behind older lines in methods of work. When closer competition sets in, when the books begin to show a balance on the wrong side, then, and probably not until then, will we see jigs, fixtures and templates for doing work now laid out in most shops entirely by hand.

Then it will matter little if an engine owner be on his yacht or on his "autobaine," pumping oil in a wilderness or grinding corn or meal on the farm; when a part breaks send a boy to town on horseback or telegraph number of part to maker and he will send you by express duplicate of broken part and it will fit. Now in most of the gas engine shops they are making machinery; after a little time it will be manufactured.

A. B. CHRISTMAN.

Repairing a Patented Machine.

Editor American Machinist:

We wish to ask a question which we think may interest many of your readers as well as ourselves. Is it legal for a machine company to make to order, from sample or description, a part of a patented machine?

The job comes to us in this way: A customer of ours owns a sewing machine. All patent rights, tools, patterns, etc., appertaining to this machine have recently been purchased by a company which wishes to drive it off the market, and to that end has destroyed all patterns and tools, and has refused to sell or issue the parts for said machine.

We are running a repair and jobbing shop. Are we obliged to search the patent records before making a duplicate of a worn out or broken piece of machinery?

This machine, being the absolute property, by purchase, of our client or customer, can we not legally make such repairs as he may order, the owners of patents on said machine having refused to do so? J. A. MACHINE COMPANY.

Editor American Machinist:

The principal inquiry by J. A. Machine Company cannot be answered by a simple yes or no.

It would be lawful to make a part of a patented machine, providing the part so made is not substantially covered by the patent, and providing also that it is not intended to aid some one in infringing the patent.

It has been held that necessary repairs may be lawfully made upon a patented machine by the lawful owner, as, for instance, the replacement on a planing machine of knives or cutters which have been worn; but your correspondent should not argue from this that it would be lawful to replace the knives in such a machine if the knives themselves be covered by the patent.

Sewing machines, like many other machines in these days are made up of numerous separately patented parts, and it is seldom that a patent covers the whole of such a machine. Any part may, of course, be repaired, though that is not necessarily to say that it may be replaced by a newly made part. Assume that your correspondent refers to the making of a shuttle, for example. Shuttles are often patented, and if this one be so protected, manifestly the company should not make it. So, in reference to other parts as well, it seems to be advisable in case of doubt or question to first examine the patents.

The fact that the patentee has refused to make or furnish the desired part does not destroy any of his rights to prohibit its manufacture, though that fact might possibly reduce his allowance of damages, should he bring suit for infringement.

The matter of allowable repairs to patented machinery has been often decided by the courts. All the circumstances of each particular case have to be considered, for the statute is silent on the subject. A universal rule could hardly be equitable, for there are machines which to repair would be to deprive the patentee of his just recompense. A patented grinding wheel, for example, is calculated to be worn away in order to accomplish its work. It cannot then be repaired without reconstructing it, and that should only be done by the patentee. And it has been held that to repair a certain dental plate by the substitution of a new for an old portion, with teeth embedded, is an infringement.

For all machines like unto sewing machines which are composed of several separately patentable parts, the legal rule seems to be that any repairs are lawful which leave the material of the machine unchanged; and substitutions of new parts for old ones are lawful, provided these parts are neither subjects of claims nor principal elements of claims.

I think you should advise your correspondent in this as in all other doubtful cases to take a look at the patents, and that the order of the owner of the machine will not necessarily relieve the shop from the consequences of infringement.

New York. WORTH OSGOOD.

Press Work Without the Press.

Editor American Machinist:

At one time it was my province to act as a sort of commissioner of ways and means in a small machine shop. The size of the shop was not, however, comparable to the ambition of the proprietor, and, despite the paucity of tools, we undertook to repair almost anything, from a steam engine to a musical box. A good deal of the business, early in the history of the shop, depended upon the working out of the ideas of several inventors, so far as these could be embodied into actual models and machines. As a general thing, inventors labor under a double disadvantage: Limited means and an inability to fully appreciate the value of the labor required to give their ideas mechanical form. Under stress of these forces, acting in and out of the shop, some peculiar jobs were handled in an equally peculiar way. For instance, take Fig. 1. Here the shoe bears a snugly-fitting metal cap *A*, which comes well up over the toe and back under the sole, as shown by the dotted lines. The cap was roughened underneath and a sheet steel clamp was applied, somewhat similar to the arrangement on an "Acme" skate, to hold the whole thing in place. The inventor's hopes and fears centered about the clamp, while the machinist was mainly concerned with the means to produce the cap.

Several plans might have been adopted. A last equal to the exterior of the shoe might have been procured, and some sheet brass or copper carefully hammered to fit the upper part, and then another piece could have been bent up for the sole, and the two pieces soldered together at the edges. Or a cast-iron die might have been made from the shoe to strike up the two halves, which could then have been joined to form the cap as before.

It may be mentioned here that a veteran molder who took some interest in the article on "Cast-Iron Dies," in issue of May 11, tells me that the secret of making cast-iron dies is in the use of oil tempered sand.

To get back to the shoe cap, which may be cast as in Fig. 2. The shoe is covered with clay to the thickness of metal required. The cylindrical shell *B* and flat plate C retain the plaster in place when poured in up to *a b*. The dowels *E E* are put in and the parts *D D* are cut away while the stuff is soft. The surface is oiled after hardening and the cylinder *B* filled to the top with the plaster. When the two halves of the mold are taken apart the portion *F* is gone over with a steel point or graver—the point projecting out of the handle the requisite depth—and then the surface is cut away to the lines thus made, and holes are made for the passage of the molten metal and for vent.

The above method could be varied by first making a plaster cast of the shoe, then increasing the size of it by the addition of clay, and then making the other half of the mold, afterwards removing the clay and leaving a space when the two halves were put together, for the desired thickness of shell. One of these methods, and I dare say both, have been used in the making of ornamental metal work.

I give these methods because they were suggested to me as the way in which the job was actually done. As a matter of fact, the groove around the sole was partially filled, and over the surface to be covered by the cap was applied a good coat of blacklead, and it was then electroplated with copper to the proper thickness, after which the copper surface was buffed and nickelplated. We were then handling, in the shop, platers' repairs and

Fig. 1

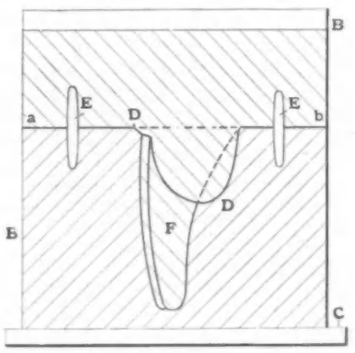


Fig. 2

Fig. 3

PRESS WORK WITHOUT A PRESS.

supplies, and the consequent trade made a very cheap, good job.

If the plating was put on slowly, as in the days of the old Smee battery, the cap would be about as smooth on the outside as on the inside. Life is too short for that process; and with such a task as that I have described, where the outside can be easily polished, the dynamo does very well. Should, however, the circumstances be reversed, and it was necessary that the metal article be smoothest on the outside, a guttapercha case or mold could be made, by coating the pattern and then plating inside the mold. Where articles of this sort are to be made in quantities, of course it is a different story; but when only one or two are needed, the kink is useful.

Fig. 3 is similar to a sketch that came my way along with a few strips of sheet copper and the instructions: "There's nothing particular about this; probably you can find something about the press to feed them along and force them up into shape." The strips were about ½ inch wide and 3 feet long and No. 26 B. & S. gage. The dimensions on the sketch came very near a 6-P gear tooth, and the drawbench gears, being that pitch, were put in motion to act both as feed and press.

Both of these, the shoe cap and the corrugated strips, may be not improperly considered press work; and there is some satisfaction in avoiding the use of expensive tools on an occasional task of this sort, even if the one for whom it is done has little or no interest in the means by which it is accomplished. R. I. Clegg.

Providence, R. I.

Scroll Chucks.

Editor American Machinist:

I feel that I must take no little credit to myself for having elicited such an interesting and valuable contribution to the ethics of criticism and discussion, and to the literature of the chuck as is embodied in the letter of Mr. J. E. Whiton, in your issue of August 3.

The survival of the fittest is never more than a temporary survival. The fittest is never the absolutely fit. The continued supersession of the fittest by something still fitter is, in fact, the most incontrovertible corroboration of my suggestion that whatever is is wrong. The scroll chuck with which I was first acquainted was then the fittest of its kind. The scroll chuck of to-day, I am pleased to testify, is better than its progenitor; but it, too, I doubt not, must give way to something better, although there may be now nothing better in sight.

I am denied the right to find fault with anything that is, until I can suggest or furnish something better. By what right, then, does Mr. Whiton criticise my sketch of the scroll and the jaw teeth, which he says "is not *exactly* right, and does not show the correct form of the teeth," without at the same time furnishing an absolutely correct sketch of those "which give much better results"? I am quite disposed to insist upon the general right of criticising things as they are, and of finding fault whenever faults exist, even if unable to suggest or supply the remedy. The world has progressed by discontent. The impulse to seek the better has usually been preceded by dissatisfaction. The remedy or the amelioration has seldom accompanied the first perception that things were not all right, and the one to first perceive the wrong has not always, or even generally, been the one to right it. There were those who kicked about the cost of fuel before Watt invented the

separate condenser. Watt, indeed, was never a buyer of fuel for pumping engines to any great extent.

In matters mechanical there often exist better ways and means which are known only to the few, and the public fault-finding often leads to a wider and fuller knowledge of them. Fault-finding in the columns of the "American Machinist" has many times led to the publication of remedial devices, and the whole trade has found its advantage in it. My criticism of the scroll chuck opens the way for our friend to assure us that it is a much better chuck than we have been in the habit of thinking it. I must assure my readers that there has been no collusion or arrangement between us for me to provide him this opportunity.

The public reproduction of figures bearing upon the efficiency of the scroll chuck seems to invite, if, indeed, it does not challenge, a public examination of them, and I am compelled to follow the lead given. If the figures do not come out as everyone would wish, there is no need of questioning my "precise standing," for the figures must support themselves. As the jaws are spoken of as "opposing each other," I am at liberty to assume that the chuck has four jaws, although I am well aware that it is made with either three or four. The pitch of the scroll being 2½ to the inch, or the radial movement of each jaw per rotation of the scroll being ⅖ inch, and 10⅓ rotations of the bevel pinion producing one rotation of the scroll, then 10⅓ rotations of the wrench and pinion move four jaws each ⅖ inch, which must be equivalent to moving one jaw 8-5 inches. Comparing this now with an independent jaw operated by a screw, the screw having a pitch of 6 to the inch, or the jaw having a movement of 1-6 inch for each turn of the screw, then for 10⅓ turns, as in the other case, the movement of the jaw will be 31-18 inches, or the movements of the scroll chuck jaws and the screw chuck jaws will be, respectively, 144-90 and 155-90, and the relative efficiencies will be inversely as the numerators of these fractions, thus making the efficiency of the screw, as compared with the geared scroll, .929. With three jaws instead of four (and three I think are generally used, because with four you can never depend upon both pairs pinching) the efficiency of the independent screw as compared with the geared scroll is, by the same process of computation, .696. This certainly gives the geared scroll some theoretical advantage, but the computation must be regarded as absolutely worthless, as it takes no account of the losses by friction in the two cases. That the friction in the case of the geared scroll chuck is very much greater than that of the independent screw, no mechanic will dare to risk his "precise standing" by denying. If anyone wants a little experience as to the friction of chucks, let him have some manufacturing job where a large number of pieces of the same diameter are to be successively operated upon. The teeth of the scroll chuck jaws not only have the disadvantage of never precisely fitting the curve of the scroll, and of having only a very narrow bearing for each tooth, as I previously indicated, but at the chucking of each piece they will always fetch up to bear upon precisely the same spot, and the demoralization of the scroll thread is soon inevitable. The same experience does not occur with the screw. The shoulder of the screw and the entire thread of the nut have always full and perfect bearing, and with ordinary care constant lubrication can also be maintained.

TECUMSEH SWIFT.

Libelling the Slotting Machine.

Editor American Machinist:

The name of the slotting machine is a libel upon it, as it conveys a suggestion of narrowness of adaptability, and of incompetence outside of the narrow field of work suggested. The machine is libelled in the shop continually by being operated as a slotting machine, when it is not doing, as in fact it seldom does, slotting work. The little sketches that I send you with this might be taken as a story without words, as probably most of your readers will see the point at once. Fig. 1 shows, what I saw only a few days ago, a slotting machine using a slotting tool and doing a job as far from a slotting job as it is possible for a job to be. For facing an elbow this machine is excellently adapted, but Fig. 1 shows how not to do it. The flanges of this elbow are 10 inches diameter, so the tool has a reach of something over 10 inches to allow it to clear. There should of course be bolts on the bottom of the slide for fastening a regular shaper or planer tool crosswise to it, so that the tool could be short and the tool holder close to the work. As the machine had no provision for holding cross tools at the bottom of the slide, I think that if I had been running the machine for such work as planing elbows I would have got up something like the rig shown in Fig. 2. Here is a casting bolted to the front of the slide, with a socket below for holding the tool. With this rig double as much work could be done as with the 10-inch slotting tool, and the elbow upon the slotting machine would then look as if it was in the right place.

For about five years of my shop life I ran a planer quite steadily, doing all kinds of planing in a general machine shop of the old school. I at different

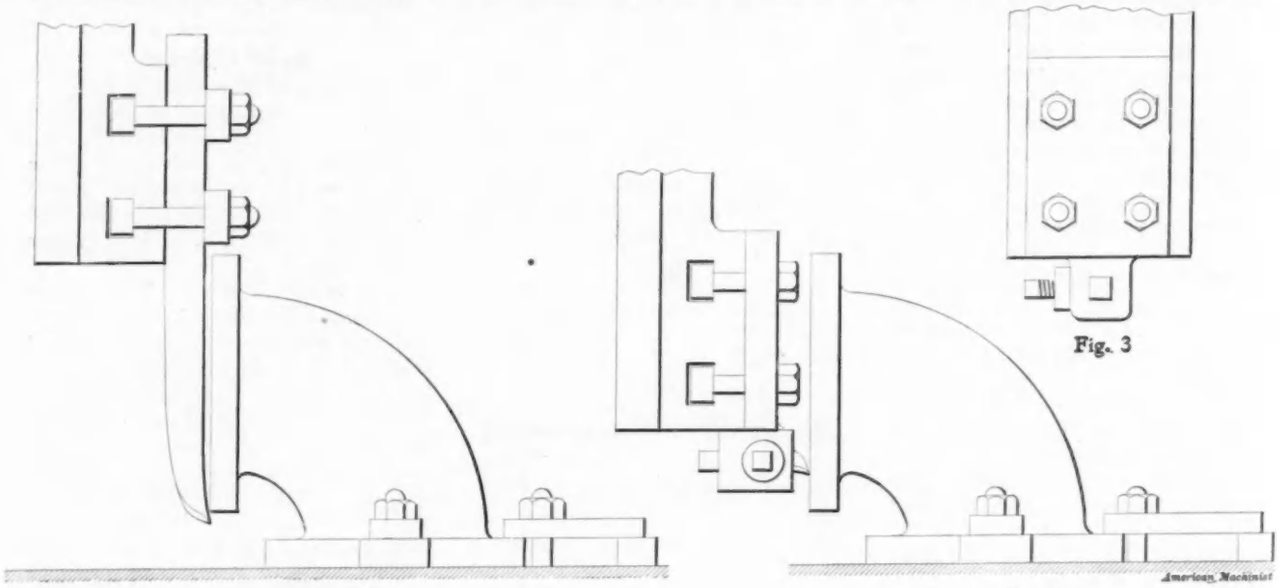
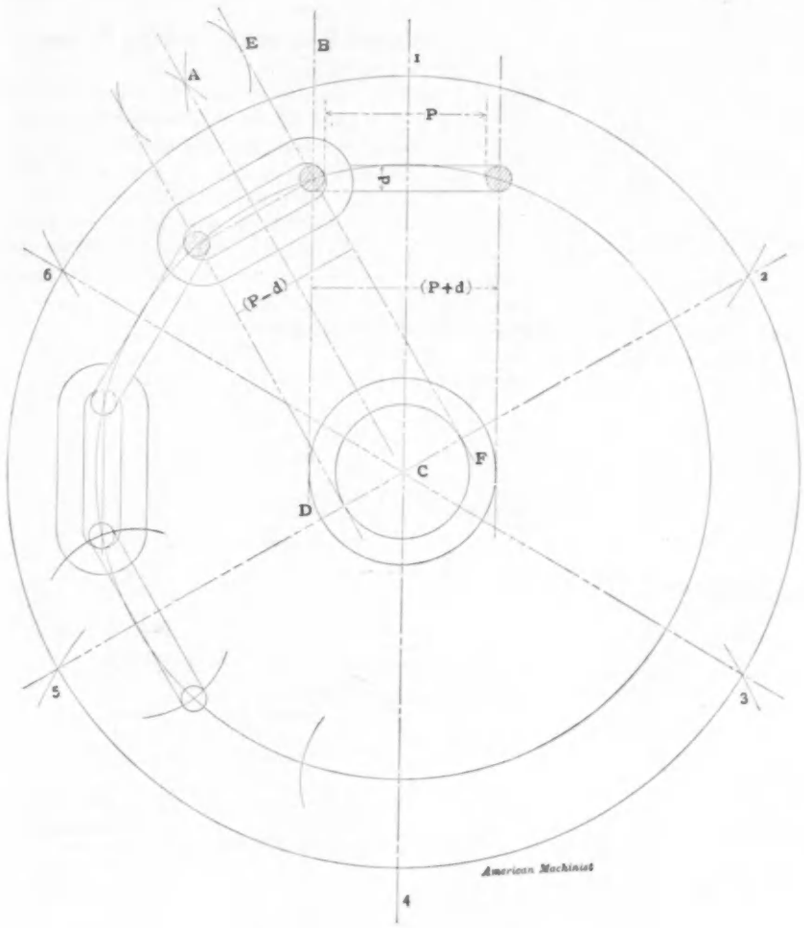


Fig. 1 Fig. 2 Fig. 3

THE WRONG AND THE RIGHT OF IT.

times had a good many elbows to plane, and I have seen other fellows plane lots of elbows, and it was always a rather unsatisfactory job. It is one of those jobs that it is never safe to crowd, while sometimes, or oftener, a fellow does feel like crowding things. You get the elbow blocked up all right, but you can't bolt it firm, and it is very apt to move sidewise. You may be lucky enough to find an angle-iron, and then you can bolt the elbow fast, but it takes time. Most fellows, when they use an angle-iron on the planer, will use it the wrong way too. For instance, to plane this elbow they would have the angle plate in front of the elbow instead of behind it, and the spring of the elbow face under the cut would be up instead of down. As a rule, for any work that calls for an angle plate on the planer, the work belongs to the slotter, or vertical shaper. Nothing could well be imagined easier or more natural than the bolting of an elbow on the slotter table and the facing of the other flange by a stiffly supported tool. MORRIS FULTON.



DESIGNING A SPROCKET WHEEL.

Designing a Sprocket Wheel for Cable Chains.

Editor American Machinist:

In sawmill machinery, endless cable chains driven by sprocket wheels are much used to convey logs into a sawmill and also for other work. These chains have long links, for 1-inch iron, often 6-inch pitch, while links are made of 1½-inch iron, reach 8 inches and even 10 inches in length. The chains are driven not by pockets in the rim of the sprocket, but by teeth which enter those links which come flatwise against the face of the wheel.

In determining the pitch diameter of such wheels the writer used the following method:

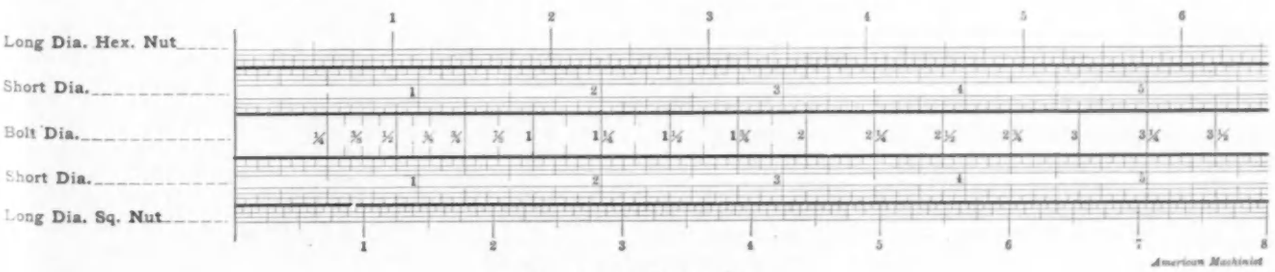
A circle is first made somewhat larger than the wheel will appear on the finished drawing. After dividing this circle into as many parts as there will be teeth in the wheel, one of the divisions is bisected. Referring to the accompanying illustration, the division 6-1 is bisected at *A*. This drawing is for a six-tooth sprocket wheel. The line *B D* parallel to 1-*C* is drawn, also *E F* parallel to *A C* and at the distances given on the drawing, where *P* equals the inside length of the link or pitch of chain and *d* measures the diameter of chain iron. At the point where *E F* cuts *B D* is the center of an end section of a link, as shown. From this the other links are quickly drawn in and the wheel finished according to the designer's ideas, usually with inserted teeth of steel, sometimes so made as to admit of adjustment for the increased pitch of chain due to wear.

A cable chain used for the continuous transmission of power seems rather a poor mechanical device. But for the work in sawmills they are reliable and have a long life. Chains of 1-inch iron are common in the Hemlock mills of Pennsylvania, while 1½-inch seems none too large for the cypress logs of the South. J. S. REID.

A Nut Dimension Scale.

Editor American Machinist:

Mr. Babbitt, in your issue of May 18, gave a pair of diagrams for long diameters of square and hexagon nuts, and to these Mr. Ward in the June 15 number adds the bolt diameters. Now, why maintain the diagonal scales at all, and why have two separate diagrams? Why not project the diagonal scales upon the base lines, and thus avoid the climbing of vertical lines to find what might be read directly from one side to the other of a single line? And then why not combine the two diagrams into a single one, which shall be more compact and convenient for constant use, and which will also afford ready comparison between the two kinds of nuts. My idea will be seen from the accompanying drawing, which may be extended to any desired length, and might



A NUT-DIMENSION SCALE.

be divided decimally if preferred. The bolt diameters are located at proper points of scales of actual inches representing short nut diameters, and the long diameter scales are projections of scales of inches laid off at angles of 45 and 60 degrees for square and hexagon nuts, respectively, as in the previous diagrams referred to. Starting with bolt diameters in the center, read above for hexagon nuts and below for square nuts.

EDWARD C. DE WOLFE.

Milling Jig—Band Sawing Fixture.

Fig. 1 in the following article represents a milling jig for a bicycle crank-axle cone.

A pair of straddle mills make the side cuts on the cone C for the wrench, and the piece-work gait at which they travel requires a pretty good chuck to hold the work.

The frame *A* is clamped to the milling machine bed, and the chuck *B* is screwed up to a shoulder in this piece from the under side. It is split at the upper end and expanded with the taper end of *D;* the handle in *D* being located within the proper segment of the circle in which it moves for convenience.

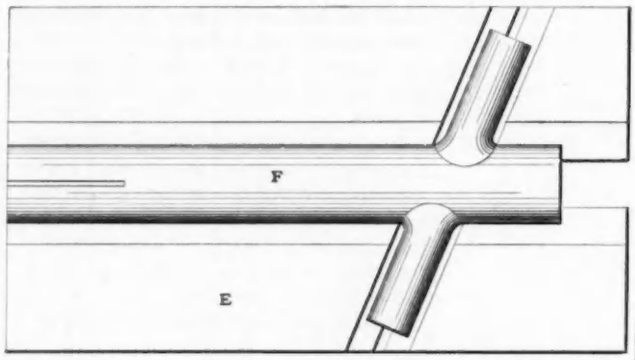


Fig. 2

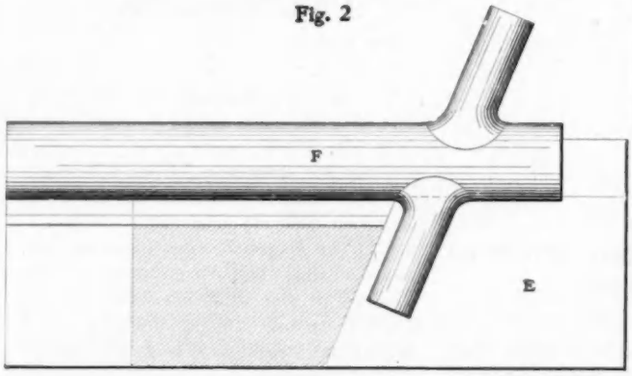


Fig. 3

JIG FOR SLITTING ON A BAND-SAW.

Figs. 2 and 3 show a simple but efficient appliance for guiding work up to a band saw for slitting purposes.

In this case a seat post is to be slotted where the cone expands it. The same, *F,* is laid in a V-block *E,* first as seen in Fig. 2, then in the same block for the cross-cut, as shown in Fig. 3; the diagonal groove locating the work in the first instance, and the vertical opening in the second. The block E is steered in a groove or between guides clamped to the sawtable.

A. H. CLEAVES.

Peoria Heights, Ill.

How to Pay Off.

Editor American Machinist:

Noticing in a recent issue certain methods of paying off large numbers of persons quickly, I would respectfully submit my method, which is as follows: Each employee is given a slip which is a duplicate of his pay envelope and has his name and number on same. It is given to him by his foreman any time on pay day. Suitable envelopes containing pay are numbered in duplicate to slips on top edge and placed in boxes containing ten subdivisions each way, that is one hundred pigeon holes. The envelopes overlap each other with just enough of the edges bare to show number and facilitate quick handling. Each compartment holds ten envelopes—1,000 to the box. Now you will plainly see that it is only the work of a moment to locate any number, as the subdivisions are numbered consecutively from the top.

As employees file by they pass slip to cashier and receive pay, when slip is either placed on file or, preferably, dropped into the tray to take the place of pay envelope.

As each employee must obtain the slip from his foreman and surrender same to cashier to obtain his pay there can be no disputes; each slip is a receipt for the pay.

I have seen the above system used where upward of two thousand employees were paid within half an hour, the line never stopping, and the employees simply calling their numbers as they reached the cashier's desk.

F. K. DAVIS.

Cutter Bars and Chucking Reamers.

Editor American Machinist:

The lathe is of very little use without small tools. First, as a matter of course, come the regular lathe tools; then for chucking and boring we need tools that will cut out stock faster than a common boring tool. In a shop where the parts vary and a good many changes are required, tools as shown here are very useful. There have been many improvements in these tools of late years, which make them more durable and also enable them to do better work. They are also made in a way that allows of quicker setting and adjusting. Fig. 1 is a cutter bar, as used a good many years ago, and many are in use still in the older shops. The weak points in this bar are, first, in the cutter *a.* The slot is so far down that it does not leave sufficient stock to hold the tit or guide from springing, and with very little strain it will break off. The weak place is shown at *a* and also in the end view. When this tit breaks off, the bar is of no further

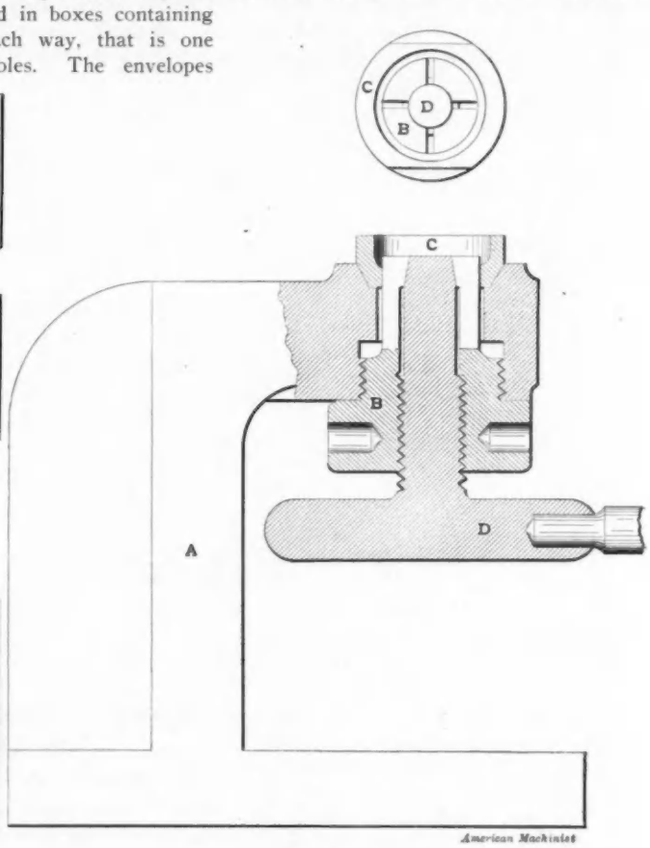


Fig. 1

MILLING JIG FOR CRANK-AXLE CONE.

use until repaired. In some of the earlier methods the slot in the bar was just the depth of the cutter, and a small set screw was fitted to hold it, the point of the screw being let into the cutter. This method is not used very much at present. Another method was to cut the slot deeper, and fit a key, as shown at *B* and at *C*, Fig. 1. The objection in this case is that the cutter is not held in a central position. With a heavy and varying cut, it will move from one side to the other and loosen the key. A better way, and now a very common one, is to lip the cutter down on the bar, as shown at *x*, Fig. 1. The cutter may be put in a lathe and bored out to fit the round surface of the bar, or it may be cut out square, and a flat surface filed on the bar, so that the cutter will fit snug. The cutter should then be keyed into the bar and turned up. With this method it is not necessary to plane the cutters, as the steel in the bar is near enough in size to fit in. Where there are a number of cutters to be made, it is a good plan to cut them off, place the lot in a shaper or milling machine, and cut the recess for the bar in all of them at one setting.

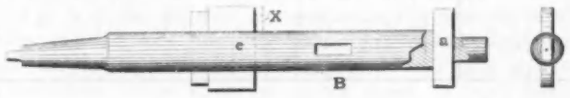


Fig. 1

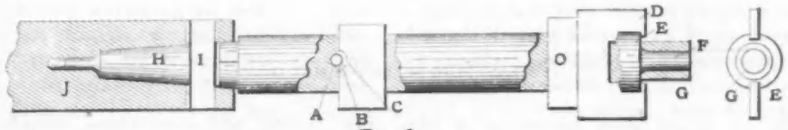


Fig. 2

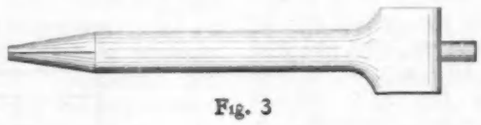


Fig. 3

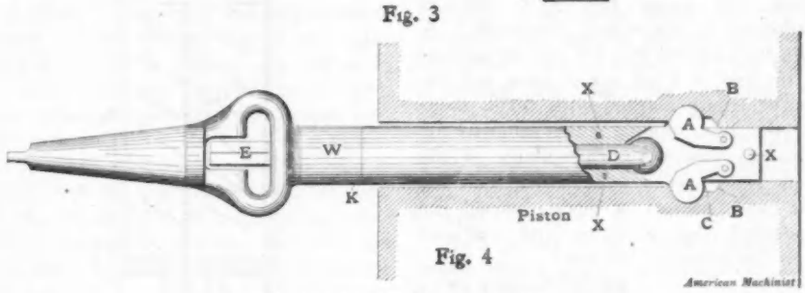


Fig. 4

American Machinist

SOME CUTTER-BARS AND COUNTER BOXES.

'Why," the other fellow says, "there is nothing new about all of this." Granted; but there is something new about the boys that are coming along and looking for these helps in the "American Machinist." How many of us can say we have not learned many kinks from its pages? I believe I got one of the first issues of the paper and one of the latest, and still I am finding new ideas between its covers. In Fig. 2 we have a very strong and substantial bar. It may be used in a lathe or drill press. By keying it into the lathe or drill spindle, as shown, it will do very quick work in lathe chucking, or as a counterbore in a drill press. There are two ways of fitting the cutter shown, both of which are good; but the one at the end is the better of the two, as it is lipped down over the bar, as shown at *E*. In addition to its being let down over the bar, it is fitted sidewise into it. This supports the cutter and allows of its being forced very hard into the work. It will be noticed that the tit is much stronger in this case than in Fig. 1, as the cutter slot does not come to the end. Another improvement is the sleeve *g*, fitted over the tit *F* to protect it from wear, and also to allow of changing the diameter of the tit for different work. This sleeve should be hardened and held from turning on the tit by a small pin fitted close up in the neck. In fitting up cutters of this kind, care should be taken to fit the key *O* so that it will have a bearing all the way across, and not on one end, as it is apt to cant the cutter. At *A, B* and *C*, Fig. 2, is shown another and very simple way of holding a cutter. It consists of a taper pin turned round and flattened on two sides. It has a bearing on the bar at *a* and on the cutter at *B*, while the bar is filed as shown at the dotted line *C*, for clearance. This allows the pin to hold the cutter hard against the bottom of the slot.

Fig. 3 is an old-style tit drill or counterbore, gotten up for short, quick jobs. The trouble with it is in the danger of breaking off the tit, as that is hardened with the lips. It is not much used at present, as the shank for driving is of such a shape that it tends to force the spindle of the machine in which it is used up from the square taper. This racks the machine and loosens the parts. Still, there are some of them in use, and will be for years, in the jobbing shop. While some of our modern mechanics will say, "Throw it in the river," the country boy will say, "You give me that drill and our old drill press, and I will finish up a job just as quick as you can do it in your newfangled, hyfernuten, what-you-call-'em machines. That drill helped my boss to earn dollars when he couldn't afford to buy improved tools, and it taught me to think and plan, and made me a better mechanic than I should have been if I had been raised on an automatic machine that takes in pig iron and turns out steam engines."

Fig. 4 is a special tool designed to cut out stock over a check valve in a deep piston to allow the liquid to pass the valve. This space is shown at *a*, where the cutter is set out for service. The valve seat is shown at *B*. This seat is formed by the cutting edge *C* of cutter *A*. These cutters *A A* are set out for cutting by forcing the rod *D* down hard between them. The end of the rod is spherical, and this is forced down by a screw thread, located at *W*, inside of the sleeve. At *E* we have a square for a wrench. The whole arrangement is used in a drill press, keyed into the spindle, as in Fig. 2. The cutters swing on small pins, and will drop back in place when the ball is raised, which allows the tool to be taken out of the hole. This device was designed for a special job, and of course will not come in for regular work. But it stimulates a line of thought in some other direction, and may help the other fellow out. It is made up in sections, and riveted together at *X X X*. At *K* it is jointed together to allow of cutting the internal thread at *W*. Tools of this class are very expensive, and if the designer of the work on which they are used will look into the tool end of the job, he will save a good many dollars. Sometimes it is necessary to cut a part of a machine in two or more pieces, to avoid the use of such tools. But this is a good thing to do, when we consider the repairs later on. If special machines could be taken to the shop for repairs when out of order, the design would not cut so much of a figure. But the repair bill on a badly designed machine has often lost the builder an order for a second one.

H. S. BROWN.

Easton, Pa.

Method of Hardening Steel.

Editor American Machinist:

In your issue of August 3, credit is given Mr. Ethier, of this place, for the invention of a special method of hardening steel. In justice to Mr. Ethier, as well as myself, whatever of merit there

is in the method mentioned should be credited to the writer. It is the result of a long series of experiments by the writer while investigating the subject of the case-hardening and tempering of steels. I introduced the method into the Trinity Cycle Manufacturing Company's factory some time before Mr. Ethier, who now has charge of the blacksmithing and hardening in the factory, came under my employ. I am pleased to say, however, that Mr. Ethier's skill and good judgment have very materially aided in the successful application of the method.

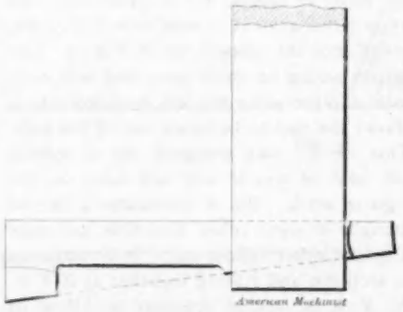
REYNOLD JANNEY,
Supt. Trinity Factory.

Use of Dentists' Concave Mirror—An Improvised Splining Tool.

Editor American Machinist:

That man, mentioned some time ago, who will not read a technical paper, can never realize how little he really knows, for it is only by learning how someone else does a thing that he finds out what an out-of-date way he has always made use of, and maybe a workman in some other trade has exactly the tool he wants.

I find the long-handled concave mirror, of about 1 inch diameter and 3 inches focal length, as used by dentists, is one



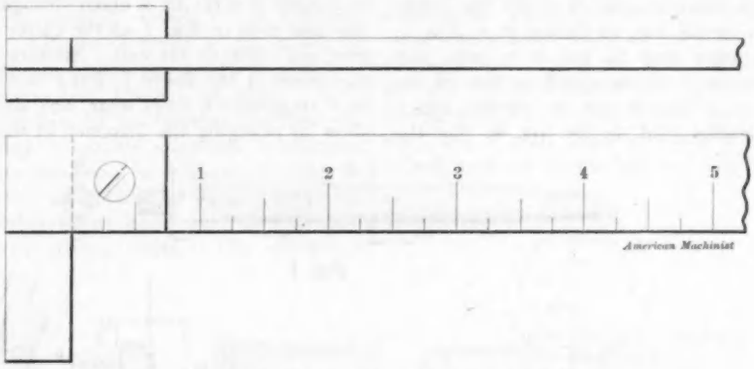
of the handiest tools to use in locating emery or chips in your own eye, and also when planing on die work and the lines are on the side of work at which the cut begins. This mirror not only reflects light on the work, but magnifies the lines so they are easily seen. It also makes straight lines look any way but straight. This does no harm, however, for if you know the line to be straight it is just as easy to work to it. And this reminds me of a use for a waste product, viz., shanks of broken taper shank drills. I find they make handy small splining tools. The No. 1 size will work through a ½-inch hole, 1¼ inches deep, without trouble. They are easily milled to shape and size when held in the same holder in which they are used. The sketch gives the idea. This is not intended to advocate omitting to purchase a proper machine for splining when enough of it is done to make a machine profitable; but one of these drill shank tools can be made and a dozen pieces splined better and quicker than by hand, and then you have the tool for next time, and at no expense for stock.

C. S. BEACH.
Burlington, Vt.

Scale Rule for Measuring Hot Iron.

Editor American Machinist:

To use an ordinary steel scale rule for measuring red-hot iron—as when one has certain lengths to cut off—the use of a little attachment such as is here sketched is recommended. It is made of sheet



MEASURING SCALE FOR HOT IRON.

steel or of any other convenient or suitable material; consists of three pieces riveted together so as to form a sort of T-square, with a head as wide as the blade of the scale rule, which can be slipped on the end of the latter and held fast by a screw. That part of the head which lies along the scale rule is graduated to correspond therewith. A scale thus altered *pro tem* can be applied on the end of a hot bar or plate and the desired length marked with chalk, without the rule slipping either endwise or sidewise, and more particularly if the chalk pieces are a trifle wider than the rule and project a little beyond its graduated edge, so as to form a groove to fit the round of the bar.

ROBERT GRIMSHAW.

A Punch and Die for Ball Cases.

Editor American Machinist:

Being a reader of your paper, I would like to give some of the other readers an idea of a punch and die that I have been using for over two years, without repairs, for punching ball cases complete at one stroke of the press. In the sketch *A* is the shell, which may be made of machinery steel. *C* is the blanking and forming part screwed into the shell *A*. *D* is the stripper that releases the work from the forming punch and center punch *E*. *G* is the spring operating the same. *F* is a screw plug for adjusting the depth of punch *E*.

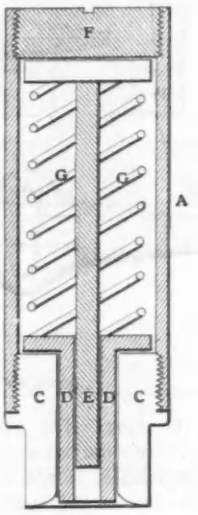
B, the die holder, is made of cast iron. *K* is the die, made of tool steel, and *H* a stripper ring, resting on pins *I*, of which there should be four. They go through *J* and B, resting on a ring below, that is not shown, and which is operated by a rubber spring held to place by a piece of gas pipe screwed to *J*. *J* is the forming plug made of tool steel, fitted into *B*, with *K* screwed down upon it.

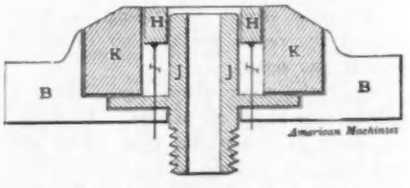
E. C. COUTLETT.
Peoria, Ill.

Automatic Machines and Automatic Men.

Editor American Machinist:

I notice that you are disposed to do whatever you can to help and encourage our British and Continental friends in their industrial difficulties. So are we all of us. It is instinctive and habitual with American mechanics to help and to en-





PUNCH AND DIE FOR BALL CASES.

courage each other, and our good-will now overflows to foreign lands. There are no particulars concerning our means and methods of production that are not open to all the world. We might say that

our trade secrets are free to all the world, only that we have no trade secrets. We are only too glad to supply to anyone who wants them the best tools that we have, the best tools that we use ourselves, and at prices never higher and often somewhat lower than Americans pay for them. We are perfectly willing not only to show how the machines are best operated, but to tell also the precise figures as to our everyday production by means of them.

It is of considerable importance to know not only how much a machine can do, but also how much it habitually does, or those not familiar with its use, but who are all too familiar, and who have been all too contented with the old jog-trot, may be satisfied with an inferior rate of production. This is especially important to call attention to, because it is in the air that American tools, when they get into English shops and factories, do not make as good a record for themselves as they have made and are continually advancing at home.

While we are doing all that we can to help our friends, we must realize, after all, that there are some things that we cannot do, however much we might wish to. It is not machines but men that do the work of the world. Tools may be ingeniously contrived to do in minute detail and in untiring repetition what they are set to do, but they are still tools, and the instruments of man's will. The will is the driver and the ultimate determining factor in prolific production. Will has made the modern tool largely automatic. Where the tool was in the olden time driven in its cutting and guided in its every movement by the human hand, the occasional glance of the human eye, and here and there the touch of a finger, are all that are now required to keep it going; but the finger touch and the look of the expert have been first most completely quickened. The automatism of the machine is begotten of the automatism of the man.

There are men who are non-automatic, and others, again, who are automatic in various degree. There are men all too common and plenty, who must be told precisely what to do and how to do it, and who also are not satisfied until the speed is fixed at which it is to be done, so that they may by no possibility exceed it. These surely, whether so born or so debased by habit, are not the automatic ones. They don't go of themselves, but have to be driven and operated like a hand lathe. There are others, again, who set out to do what they can as best they can, and to whom the better and the speedier ways are revealed as they advance. The doing of things is to them never to be in a fixed and unchangeable way, nor at an unvarying rate. To-day sees better accomplishment than yesterday, and to-morrow still better than to-day. These are the self-acting, the self-driving, the automatic ones, and it is for the service of these that the automatic machines of America have arisen. England and Germany and Russia, and the rest of them, may buy our automatic machines, but, unfortunately for them, they cannot get our automatic men, and therein, I take it, is their case most hopeless.

After getting the best machines in the world and being as fully informed as possible as to the best methods of using them and the rates of their production the foreign manufacturer is still lamely equipped for the industrial race until his men are all right. Since he cannot get American automatic workmen his only hope must lie in the automatizing of his own, and little apparently is being done toward it. The stimulus and inspiration for automatism in men are in the promise or the prospect of increased remuneration, and of this we hear little or nothing from across the water. A fixed classification of men and a fixed rate of wages for each in any class, and this rate secure to the men at their present gait, with no higher rate of wages in sight for more or better work, is a condition not likely to quicken things.

The English workman is human, and he is still, as he ought to be, intensely English. Is he to be delighted to see the "Yankee" machine turn out more and better work when it is not to put another penny in his pocket? Is he likely to crowd any machine for all it is worth, as an American workman can be induced to do, without equivalent inducement?

There is one thing about the British workman that puzzles me and makes me sick when I stop to think of it; and there is nothing that makes the restoration of British industrial supremacy seem so hopeless. It is that pay does not pull. Here is the condition as I find it frankly stated in a recent editorial in "Engineering," London:

"As a matter of fact, certain classes of British workmen are less efficient the more they are paid, and whilst most employers feel a certain satisfaction and pride in having well-paid employees, they not unnaturally resent this high rate of pay being made an excuse for the men absenting themselves from work two or three days a week. Moreover, in too many cases where a workman makes very high wages, his wife and family are, if anything, the worse off for it. In such cases the wife is handed a far from proper proportion of the earnings to keep house on, whilst the remainder finds its way into the coffers of Mr. Bung. The more such a man receives the less likely is he to make either a satisfactory workman or a decent husband and father."

I worked side by side for years with an English machinist of the class here spoken of who had strayed over here. He was the best latheman in the shop, or as good as the best, and he got the highest wages. By permanent arrangement less than one-half of his wages was regularly handed over to his wife for all the expenses of the household, the rest being spent for drink and dissipation, and whenever he could beat the "old woman" out of an additional quarter he actually knew no better than to brag of it. God help the nation where such as these are plenty. Of a very different type is the American workman. MORRIS FULTON.

The Shifting Gear Arrangement on Lathes.

Editor American Machinist:

Mr. Richards in his article on "Machine Tools," and Mr. Grant in his article of August 3, refer to an arrangement of a driving gear for lathes to shift from engagement with gear on spindle to engage with gear on cone pulley to be used in cutting screws of coarse pitch.

I ran one of the Putnam lathes, to which Mr. Grant refers, in a jobbing shop, and while the arrangement referred to often came in handy for the purpose which they mention, its most valuable feature was that it enabled me, by merely shifting the gear, to obtain a very coarse feed for finishing cuts.

While we are all used to finishing feeds of ½ inch or more on a planer, a fine feed is usually still used on a lathe on account of its being impossible to get coarse feeds except by the use of the lead screw, which does not help us at all for cross feeds.

I wonder that the shifting gear has not been universally adopted, as it adds very little to the cost of the lathe and is certainly a great time saver.

WILSON P. HUNT.

Moline, Ill.

Questions and Answers.

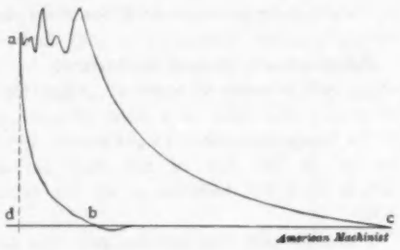
Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(74) J. T. E., Superior, Wis., writes: Will you tell me the difference between mild steel, machine steel and Bessemer steel? A.—These are simply different terms for what is usually essentially the same thing. That is to say, mild steel (by which is meant steel that is low in carbon) is usually employed for machine parts, and for that reason is sometimes called machine steel to distinguish it from tool steel, and this steel is usually made by the Bessemer process, so that it may be called Bessemer steel, although Bessemer steel may sometimes be too high in carbon to be called mild steel.

(75) O. T., Summit, N. J., asks: Can you let me know if there is any way of making steel tools such as jewelers' tools, which have been overheated, fit to use again? The grain of the steel is quite coarse. A.—There is no way of completely restoring steel which has been

overheated. It may be very much improved, however, by heating it to a moderate or low red heat and quenching. You will find after this is done that the grain has been refined, and for small tools such as these very good results have been obtained by heating in a Bunsen gas burner and then penetrating with the red hot tool a lump of beeswax. (2) Will a coating of tin on steel prevent corrosion when the steel is immersed in salt water? A.—It is doubtful if it will prevent corrosion permanently. Ordinary tin plate is steel coated with tin, and we know that while this will remain bright for a short time in salt water, it begins to rust before long.

(76) J. F. H., Quincy, Ill., incloses the air compressor card from a 6x6 compressor, reproduced herewith, and asks if the card is what it should be, and if not how to improve it. A.—Your card shows an excessive loss due to large clearance in the compressor cylinder. If there were no clearance its line *a b* would drop abruptly, but there being considerable clearance the air contained in it at the end of the stroke re-expands in the manner



shown. With such a card the actual air taken in is shown by the length *b c* instead of the full length *a c*. Measuring these lengths on your original (reduced in the reproduction), we find *b c* = 3.1 inches, and *d c* = 3.9 inches, the ratio of which is $\frac{3.1}{3.9} = .795$. In other words, you get only 79½ per cent. of your cylinder displacement. With large compressors this figure may reach 96 or 97 per cent., and with some special designs it almost disappears. With a machine the size of yours the figure cannot be pushed much above 90 per cent., but it should not fall below that figure. The fault may be inherent in your machine, or it may be capable of being corrected, but we cannot determine this from the information at hand.

Paris Exposition Plans.

Several weeks ago we published detailed information upon the plans of the American tool manufacturers at the Paris Exposition of 1900. It will be remembered that the plan was that they should erect for their own use at Vincennes, seven miles from the main grounds, a building where their machines could be shown in operation more extensively than in the space allotted at the Champs de Mars. The intention at that time was to put a gallery in this building, thus making it two stories high. Subsequently, however, a concession has been obtained to make the building 100 feet longer than was at first arranged, and the gallery feature has been abandoned. The structure will thus be 345 feet in length by 78 feet 9 inches wide. The drawings are now in the hands of the builders, and the company that will furnish the iron work has contracts for the same which will be signed upon the return from Europe of Mr. F. E. Drake, director of the Department of Machinery and Electricity.

Capt. A. H. Mattox, of the Bureau of Publicity, informs us that the French Technical Committee on Electricity have just presented to Commissioner General Picard their second report, regarding the supply of motive power at the Exposition. They have confined themselves to an examination of the question from a technical point of view. They have been guided by the general conditions imposed upon bidders, stated the power which the apparatus ought to furnish, and remarked upon several points of safety and good operation.

The committee have reported figures showing the total power that would be developed at the Exposition. It is thought that 45,000 horse-power may be required, though possibly one-half of that quantity may suffice. For motive purposes 5,500 horse-power will be needed, which is more than twice the power actually utilized at the Exposition of 1889. In 1900 the power will be electrically transmitted, which, of course, was not done eleven years ago. For lighting purposes 15,000 horse-power are estimated for next year, and for an extraordinary illumination 20,000 horse-power.

The motive power at previous Paris expositions was as follows: In 1855, 350 horse-power; in 1867, 626; in 1878, 2,500; in 1889, 5,500 installed, but only 2,500 actually employed.

Personal.

Mr. E. Krause, managing director of the Vienna branch of Schuchardt & Schutte, will sail for the United States on the 22d instant.

The name of Ambrose Swasey, of Cleveland, O., appears in a list of newly elected members of the Institution of Mechanical Engineers of London.

Mr. Wm. H. Edmondson, formerly of Worcester, Mass., is now in charge of the drafting room at the works of the Locomobile Company of America at Westboro.

Mr. Louis Bendit has been appointed by the Chicago office of the Bethlehem Steel Company as their representative for St. Louis, succeeding W. L. Gowels, formerly of Gowels & Freeman.

Mr. J. C. Speirs, who has long been identified with the drop forging and bicycle business in Worcester, Mass., has become manager of the Westboro plant of the Locomobile Company of America.

Our occasional contributor, Walter Ferris, M. E., who is a graduate of Lehigh University and has had considerable experience in shop work and as an engineer, has opened an office as consulting engineer at 931 Chestnut Street, Philadelphia, Pa., and will give special attention to the design of special machinery, development of inventions, etc.

The management of the New York office and district of the Pratt & Whitney Company has been assumed by J. W. Cregar, formerly of Philadelphia. The machinery business hitherto conducted by Mr. Cregar at the Bourse, Philadelphia, will be continued in charge of L. E. Beaman, son of the senior member of Beaman & Smith, Providence.

American Locomotives in England.

A press cablegram, dated London, August 11, says: "At a meeting of the Midland Railway Company to-day the chairman announced that the locomotive superintendent had reported that although the first ten American locomotives were by no means equal in finish to any English locomotives, they were doing their work satisfactorily. It was the company's custom, he said, to run engines a thousand miles and then to overhaul them, charging any defects to the makers. The same rule would be applied to American locomotives, and the company would then be better able to form a reliable opinion of their merits."

An unusually large emery wheel was recently shipped by the American Emery Wheel Works, of Providence, R. I. It measured 3¼ feet in diameter, and was 12 inches thick. It was built up on a special iron center 31 inches in diameter, which ran on a 3 5-16 inch shaft. The whole affair weighed over 1,200 pounds. The wheel was designed for grinding wooden balls.

We inadvertently omitted to state that the horizontal boring machine illustrated and described in our issue of August 3 is made by the Newark Machine Tool Works, Newark, N. J.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 16.
Caliper cat. free. E. G. Smith, Columbia, Pa.
Forming lathes. Mer.Mach.T.Co., Meriden, Ct.
Punches & dies. Wal.M.Wks., Waltham, Mass.
Patents. W.E.Willis, Sec.W.Bourse, Phila., Pa.
Cam cutting. F.J.Stokes Mach.Co., Phila., Pa.
Spiral gears of varying angles and ratios. The Arthur Co. See page 15.
Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.
Book "Dies and Diemaking," price $1, postpaid. J.L.Lucas, Prov., R.I. Send for index sheet.
"Brandt's Triple Expansion Gaskets" are

the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

Will sell automatic, self-opening die; thoroughly tested; patents pending. Address Box 172, AMERICAN MACHINIST.

For Sale, Cheap—2 and 3 horse-power gasoline engine castings. Christison & Jones, 399 Goodrich ave., St. Paul, Minn.

For Sale—Six small automatic tapping machines, capacity 3-16, new. Crescent Tool Works, 121 George st., Bridgeport, Conn.

Bound volumes of "American Machinist" for 1893 and 1894, cloth, good condition, $3 each; one of 1888, morocco, $4. "Volumes," care AMERICAN MACHINIST.

Rose's "Modern Machine-Shop Practice," Reuleaux's "Constructor," back volumes "American Machinist," bargains; what offers? Box 201, AMERICAN MACHINIST.

Gear and milling cutters, adjustable reamers and special tools; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

Have a first-class agricultural machine, just patented, partly introduced, with good success and prospect, and have in view a very suitable for sale machine works; capital wanted to push same. J. M. K., Box 6, Maria Stein, O.

Institutions retiring from business having machine tools, brass or wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

A large factory close to Boston, equipped with best makes of machinery, drop hammers, lathes, planers, polishing, plating, enamelling depts., hardening and annealing furnaces, suitable to the manufacture of automobiles, would like to figure on whole or parts of motor vehicles. Address "Confidence," AMERICAN MACHINIST.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Mechanical engineer and draftsman is open for engagement. Box 180, AMER. MACHINIST.

Technical mechanical draftsman, 5 years' experience. Box 203, AMERICAN MACHINIST.

Mechanical draftsman wishes position; New York or vicinity. Address Box 202, AMERICAN MACHINIST.

Draftsman, technical education and 1 year's experience, desires a change. Address Box 192, AMERICAN MACHINIST.

Wanted—Position as foreman pattern-maker; 15 years' practical experience. Address Box 191, AMERICAN MACHINIST.

Foundry foreman wants position; heavy work, or light; experienced handling men, mixing irons; first-class references. Box 205, AMERICAN MACHINIST.

Draftsman and designer of Corliss engines, air compressors, automatic machinery, etc., desires change; competent to take charge. Box 206, AMERICAN MACHINIST.

The manager of a successful foundry and machine shop has satisfactory reasons for wishing a change in location. Address "Treasurer," care AMERICAN MACHINIST.

Superintendent or general foreman that can handle men and design up-to-date machinery and tools, wants a Western position. Address Box 195, AMERICAN MACHINIST.

Draftsman, mechanical, technical graduate, good practical and drawing-room experience, wants position in shipyard or machine works; best of references. Box 210, AM. MACH.

Mechanical and civil engineer, college graduate, 15 years' experience in drawing room, shop and field, used to handling men, wants position in shop or field. Box 196, AM. MACH.

Experienced mechanical engineer, graduate, wishes situation as superintendent; specialty, design and development of light, intricate mechanisms and methods of duplication. Box 199, AMERICAN MACHINIST.

A first-class draftsman, who is a pattern-maker by trade, desires a change about July 15; experienced on general machines, punch and shears, machine tools and automobiles; best of references. Box 209, AMER. MACH.

Wanted—Position as manager or superintendent; 20 years' experience in designing, constructing and managing, mechanical and electrical manufacturing; best N. Y. references. Address Box 173, AMER. MACHINIST.

Wanted—Position as mechanical engineer or as chief draftsman; experienced on designing the heaviest class of machinery, plans for steam power plants and heavy mill work; has held last position for 7 years. Box 193, AMERICAN MACHINIST.

Mechanical engineer and draftsman, 20 years' varied experience in designing special machinery, ice and refrigerating and automatic machines; inventors' ideas worked out and put in practical shape; New York or near vicinity. Address Box 200, AM. MACH.

American mechanical engineer, technical graduate, with up-to-date, practical experience, and at present holding responsible position in Europe, desires change; could be useful in connection with Paris Exposition. Full particulars and best of references given on application to Box 189, AMER. MACHINIST.

Mechanical engineer, thoroughly experienced every branch practical works management, speaking Spanish, seeks position as superintendent, or otherwise; steady, active, reliable, good designer, methodical, self-reliant, ambitious; at present holding responsible position; high-grade work; engines, boilers, power transmission, hydraulic, mining, smelting, special machinery. Box 207, AMERICAN MACHINIST.

Help Wanted.

Wanted—Machinists and molders on engine work. Payne Co., Elmira, N. Y.

Wanted—First-class pattern maker on valve work. Address Box 178, AMER. MACHINIST.

Pattern-makers wanted. Apply to The De La Vergne Refrigerating Machine Co., foot E. 138th st., New York.

Wanted—Foreman for brass foundry; state age, experience and wages expected; location near Albany. Box 208, AMER. MACHINIST.

Wanted—A good machinist who has had experience on Jones & Lamson flat turret lathe. The Reeves Machine Co., Trenton, N. J.

Wanted—First-class machinists on engine work, both machine and floor hands; highest wages paid to first-class men. Barr Pumping Engine Co., Philadelphia.

Wanted—Six first-class machinists on floor work; those familiar with steam-engine work preferred; steady job; state experience and wages expected. Lock Box 265, Seneca Falls, N. Y.

Wanted—Chief draftsman; must be quick, accurate, familiar with modern methods, able to organize drafting department; state experience, reference and salary. Box 198, AMERICAN MACHINIST.

Wanted—Good draftsman, experienced in designing jigs; permanent position to the right man; only written applications will be considered. American Ordnance Co., 718 Crescent ave., Bridgeport, Conn.

Wanted—Superintendent, experienced in first-class shop practice, to cut costs and organize and systematize growing shop; good place for a good man; state experience, methods, references and salary. Box 197, AMERICAN MACHINIST.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite applications from draftsmen, pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—Man to take general supervision of power plant in large factory; must thoroughly understand erecting machinery, shafting, stand pipes and electric work; give experience in detail and state references, which must be A No. 1. "Factory," care AM. MACH.

Wanted—A machine-shop foreman for an interchangeable class of work, to handle 100 men; must be a natural mechanic, a clean, clear thinker, systematic, neat and, above all,

(*Continued on page* 42.)

The latest addition to the list of trade journals is called "The Automobile," which is an illustrated monthly devoted to the subjects indicated by its title. It is published at 150 Nassau street, this city, by the E. L. Powers Publishing Company.

A slight variation of the Cleveland oil swindler's tale of woe is found in a recent proposition of the Eastman Oil Works, which states that they are closing their Boston warehouse, and find they have half a barrel, etc., etc.

When the vessels now in course of construction are completed, the United States navy will number, of effective ships, fit for war service, 240 vessels of all classes.

The Ross Valve Company, of Troy, N. Y., is installing its hydraulic organ-blowing engines in St. Paul's Cathedral, London.

The last tubular bridge on the American continent, over the Ottawa river at St. Anne's, Canada, is being removed, and a truss bridge erected in its place.

Manufacturers.

Wm. Steele & Son, of Philadelphia, are soon to commence the erection for the Oldham Mills.

The Fairmount (Ind.) Glass Works are preparing to build another factory adjoining their present plant.

Fire causing a loss of $250,000 destroyed the works of the Glens Falls (N. Y.) Portland Cement Company recently.

The Wilkes Rolling Mill Company broke ground recently at Sharon, Pa., for a sheet mill, to cost $50,000 and employ 100 men.

Pattin Brothers, Marietta, Ohio, are erecting a two-story brick machine shop, 60 feet by 120 feet, to be equipped with new tools.

It is very probable that the plant of the Colorado Fuel & Iron Company, at Pueblo, Colo., will be considerably enlarged in the near future.

The Globe-Wernicke Company contemplates the erection of a new factory at Norwood, Ohio. This factory will be 300x250 feet, and will cost about $135,000.

Work has been commenced on the new foundry building for the Farist Steel Company, Bridgeport, Conn. It will be of brick, 86x100, with gravel roof.

The work at the erection of the new plant of the Atlantic Refining Company, at Ernest Station, Pa., is progressing rapidly, a large force of men being engaged.

The Vulcanized Fibre Company, Wilmington, Del., will enlarge its plant, at Tenth and Walnut streets, by the addition of a three-story building, 31x128 feet, which will cost $5,200.

Andrew J. Brunner, contractor, of Wister street, will erect for Why Brothers, textile manufacturers, a two-story addition at their

We Make **Boring Machines, Milling Machines, Special Tools,** BEAMAN & SMITH, Providence, R. I.

plant on Wakefield street, near Collom, Philadelphia, Pa.

A reorganization of the Sharon Boiler Works, Limited, Sharon, Pa., has been effected, and the capital stock increased to $50,000. The company has purchased land and will erect a new plant.

The Lookout Sewer Pipe Works, Chattanooga, Tenn., which plant was completely destroyed by fire some three months ago, will be rebuilt on the site of the old building, near Blowing Springs, Ga.

A plant is being erected at Edgemont, S. D., by the Burlington road, to be used for treating railroad ties by a process designed to preserve them. The plant is estimated to cost $40,000.

Work on the foundations of the new smelting plant of the Dominion Iron & Steel Company, at Sydney, N. S., will be commenced at once. The foundations, which will be of concrete, will cost about $150,000.

Architect Robert Cammerer is working on plans for a four-story brick and iron scale factory, about 40 by 120 feet, to be built at the plant of Henry Troemner, Twenty-second and Master streets, Philadelphia, Pa.

The Lovell Manufacturing Company's plant, Erie, Pa., will receive an addition, a permit having been issued recently by Building Inspector Spencer for the erection of a three-story brick addition to the present factory.

A large malleable iron foundry is to be established at Peoria, Ill. The Burlington Railroad Company is said to be interested in the project. The capital stock will be $200,000. The work will give employment to 150 men.

The Lanchester Motor Company, which was incorporated at Trenton, N. J., recently, has for its specialty the manufacture of motors of large horse-power, to be used in connection with trams, freight cars and heavy trucks.

Ground has been broken for the extension to the Aberfoyle Manufacturing Company's plant at Fourth and Morton avenue, Chester, Pa. When the additional buildings are completed the capacity of the present extensive works will be doubled.

The seamless tubing, electric welding of bicycle parts and general welding business of the Standard Tool Company, Cleveland, has been transferred to a new company, known as the Standard Welding Company, doing business in the same city.

A steel and iron manufacturing plant is to be erected at Chester, Pa., by a company being formed with John G. Johnson and F. P. Pritchard, of Philadelphia, Pa., at its head. The capital is about $500,000, and a plant employing about 600 hands will be constructed.

The Buffalo Forge Company will build a five-story brick machine shop at the corner of Broadway and Tousey street, Buffalo, N. Y., at a cost of about $30,000. Plans have been filed with the Bureau of Buildings. The new building will be 52 feet wide by 212 feet deep, and will be of slow burning construction.

F. L. Nichols, formerly vice-president and general manager of the old Howard-Harrison Pipe Works at Bessemer, is heading a company which will build a new cast-iron plant near Birmingham, Ala. The plant will have a daily capacity of not less than 100 tons, and will cost in the neighborhood of a half million dollars.

Jones & Lamson Machine Company, of

(*Continued on page* 43.)

Help Wanted—Continued.

one who acts rather than talks; a liberal salary to the right man. Box 194, AM. MACH.

Wanted—At once, a first-class civil engineer or mechanical expert, thoroughly acquainted with machinery for tool-making and turning out implements in large quantities; the position would be that of a manager of the technical department in a factory of automatic music-boxes; a most energetic person and good organizer, having his men well in hand, is needed; only gentlemen with best references need apply. Box 204, AM. MACH.

Wanted—Foreman, a good, energetic, experienced man for our wood-working business; one familiar with wood-working machinery and hand tools and forming fine work; must have business ability and be competent to handle large number of workmen and follow a good number of orders at one time, to advantage; a good, permanent place for a first-class, steady man; experience, reference and salary required with application; also a good man for Last turning lathe. Lock Box No. 232, Bridgeport, Conn.

Wanted—A technical college graduate of at least 3 years' practical and responsible experience in the designing of special machinery; application must contain a list of at least a dozen machines (not engines) designed by candidate, and also contain an outline of the variety of work he would give to each of a score of seniors on the basis of 300 hours, and propose a method of conducting this work; please state frankly minimum salary that would be accepted; promising candidates will receive additional information from a circular that will be forwarded; required work begins September 25. Send promptly list, outline and references to Professor of Mechanical Engineering, 357 Market st., Bethlehem, Pa.

Pulleys, Ring Oiling Hangers.

Pulley Moulding Machines, Pulley Lathes.

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Gear Wheels and Gear Cutting
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about that light machinery contract you're going to give out till you get our figures.

We're after just such work as that because we've the "know how" and the facilities for doing it right, and the chances are that we can make you an interesting price.

If you're not too far away, we'll come and talk it over with you.

You'd better write to us about it anyhow.

THE Dunham Machine Works,
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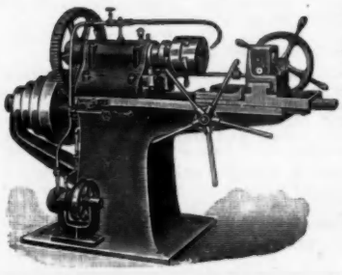

Automatic Bolt Threaders

Sizes: Bicycles Spokes to 4-in. Bolts.

Detrick & Harvey Machine Co.,
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WE MAKE A SPECIALTY OF Improved Metal Planers. **L. W. POND MCH. CO.,** Worcester, Mass., U.S.A.

SUPERIOR TO OTHERS IN TEMPER AND CUT.

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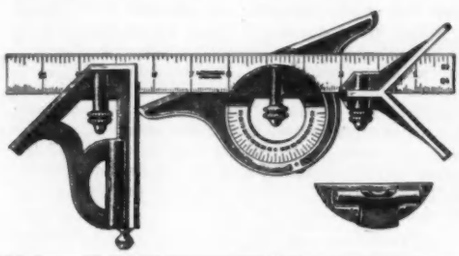

TOOLS FOR MACHINISTS

The Starrett No. 9 Combination Square.

Send for our Catalog of Machinists' Tools. The Starrett and Brown & Sharpe specialties.

Hammacher, Schlemmer & Co.,
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FOR SALE—ON HAND

One 24 in. x 24 in. x 6 ft. Pond Planer.
SECOND-HAND. CONDITION A1.

One 30 in. x 30 in. x 8 ft. Planer. New.

Woodward & Powell Planer Company,
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We Claim the Following Merits for ..... **Jenkins Bros.' Valves.**

1. Manufactured of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contains JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
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GRINDING IN DAMP ATMOSPHERE.

The surface of some makes of emery wheels when exposed to moist air becomes soft and gummy.

CARBORUNDUM

wheels are rendered moisture proof by the vitrifying process of cementing or binding the material into shape. Carborundum is the best abrasive because it works faster, it works better, and it takes less to accomplish the desired result.

Beware of a substance called Emery-Carborundum.

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Courses in ....
Mechanical Engineering,
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Catalog sent on application.

Bevel Gears

Cut Theoretically Correct, Special facilities for cutting worm and spiral wheels.

Hugo Bilgram, Machinist,
440 N. 12th St., Philadelphia, Pa.

(*Continued from page 42.*)

Springfield, Vt., are making extensive improvements to their plant, and have let the contract to the Berlin Iron Bridge Company, of East Berlin, Conn., for a new steel building, 60 feet wide and 95 feet long. The building will have many special features which make it exceedingly interesting.

The Heine Safety Boiler Company, of Germantown, Pa., has let the contracts for the erection of their plant at Phoenixville, Pa. The buildings will be 125 by 100 and 100 by 65 feet in dimensions, and are to be constructed of iron. The company is now moving its machinery from Germantown, and as soon as the buildings are completed will begin with 200 hands.

The Imperial Art Company was incorporated at Trenton, N. J., recently, with a capital stock of $1,500,000. The incorporators are Hugh H. Hamill and John H. Scudder, of Trenton, and Colonel A. R. Kuser, of Newark. The new company is to absorb the Trent Tile Company and the large tile works at Barberton, Ohio, both of whose plants it has purchased.

The Rock Island (Ill.) Plow Company is contemplating extensive improvements. The amount to be expended is about $40,000, which will go towards remodeling and installing new machinery in the various departments, increasing the shops and erecting a two-story pattern room. It is to be of brick and built adjoining the foundry. The dimensions are 36x70 feet.

The plant of the Galey & Lord Manufacturing Company, at Fourth and Morton avenue, Chester, Pa., is to be greatly enlarged, and the present brick structure is to be extended to the Hinkson street end, practically doubling the capacity of the present structure, and giving employment to about 200 additional hands. There will be installed about 300 new looms and all the machinery for the making of the product of this mill.

The Sargent Company, Chicago, Ill., manufacturers of steel castings, is to remove from the city to Chicago Heights, where it will build four large factory buildings, 100x500 feet each, to cost $175,000. The plant at Chicago Heights will be larger than the old one, and will be established on a tract of sixteen acres that has been taken by the Sargent Company. The general scope of the concern will be increased, and it is expected to give employment from the start to 700 men. Work on the buildings is to be begun shortly.

New Catalogs.

The Springfield (Vt.) Separator Company sends us small catalog of their oil separators and filters. The operation of these machines is explained, and the catalog gives a list of users of them.

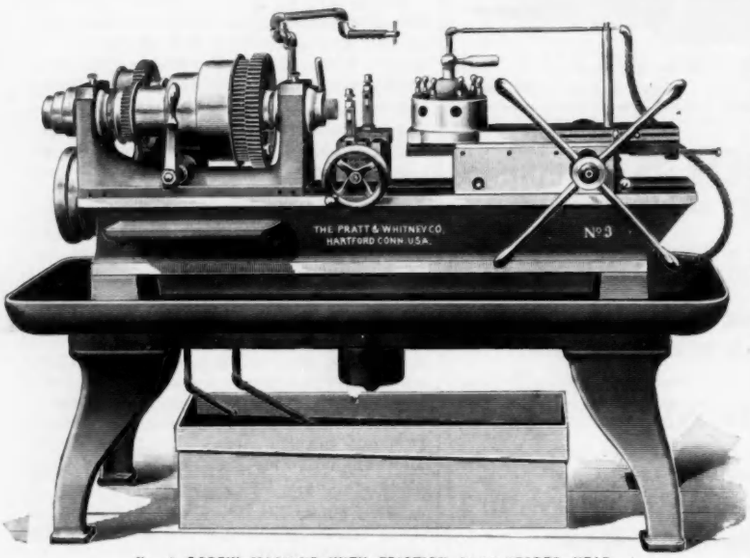
Star Dynamo Works, Jefferson City, Mo., sends us catalog of dynamos and motors, also volt and ammeters, rheostats and other electrical apparatus. The catalog is standard size, 6x9 inches.

The Standard Welding Company, Cleveland, Ohio, sends us catalog describing and illustrating electrically welded specialties, such as seamless bicycle tubing and other bicycle parts. The catalog is standard size, 6x9 inches.

We have received from the Cleveland (Ohio) Machine Screw Company Catalog E of automatic machinery used in the manufacture of bicycles, sewing machines, cash registers, etc., in fact every line of manufacture where production of multiple parts is desired. The catalog is 5¼ x 7½ inches.

The Pratt & Whitney Company,

High Grade Machine Tools.
Turret Head Screw Machines.



No. 3 SCREW MACHINE WITH FRICTION BACK-GEARED HEAD.

With or without Wire Feed, Draw Back Collet mechanism, Friction Clutch, Back Gears and Automatic Feed for Turret Slide. Every operation (except slotting the head) in the production of screws is performed successively on these machines without removing the work from the chuck, stopping of machine or changing of tools. Slides operated wholly by hand levers, or partly by hand and partly by power or wholly by power mechanism. Seven different styles and 36 different sizes and constructions. Fitted to order with tools to reproduce sample screws, studs, nuts, plumbers' and gasfitters' brass goods and irregular pieces of circular cross section in various metals using bars of 1-16 to 3 3-16 inch. The heads of the hand lever machine are often made with friction clutch back gears to facilitate quick change of speed of spindle when light and heavy cuts are required on one piece.

Ask for Booklet and "Machinists'" Catalog.

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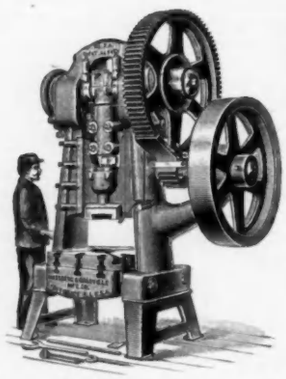
JEWELERS' AND SILVERSMITHS' MACHINERY A SPECIALTY. COMPLETE PLANTS ERECTED.



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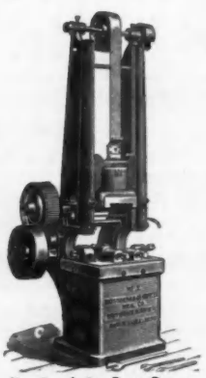

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AUTOMATIC DROP PRESSES.
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